Metals Review

The News Digest Magazine

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Foundry Issue

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Metals Review

THE NEWS DIGEST MAGAZINE

RAY T. BAYLESS, Publishing Director — MARJORIE R. HYSLOP, Editor — GEORGE H. LOUGHNER, Production Manager

VOLUME XXI NO. 4 — APRIL, 1948

A.S.M. REVIEW OF METAL LITERATURE

FOUNDRY SECTION

LECTURES REPORTED

DEPARTMENTS

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The newest addition to the Library!

★ ★ ★

INTRODUCTORY PHYSICAL METALLURGY

by **CLYDE MASON**
Professor of Metallography, School of Chemical and Metallurgical Engineering, Cornell University

This interesting book on physical metallurgy is based on a series of lectures presented during the 1947 National Metal Congress and Exposition. Prof. Mason points out that within the present generation scientific knowledge of metals has grown enough so that we can begin to understand what goes on inside them, and why they behave as they do. This is the field of physical metallurgy.

It is up to the worker with metals to follow what's new as well as to understand what's old, and this book helps the reader to do just that. General principles and behavior that are common to many metals are summarized. Knowledge of the alloys of one metal frequently applies to those of another, and as Prof. Mason says, "it won't hurt any 'brass' man to learn a little about alloys that aren't yellow, particularly since metals are so often in competition with each other."

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130 Pages . . . 6 x 9 . . . 76 Illustrations . . . Red Cloth Binding . . . $3.00

AMERICAN SOCIETY FOR METALS

7301 Euclid Avenue **Cleveland 3, Ohio**

Foundry Practice

By H. W. Lownie, Jr.

A Survey of a Year's Literature Indicates That Shortages Still Plague the Foundry Industry; the Growth of Cooperative Technical Activities Is a Most Encouraging Trend

RAW MATERIALS in adequate supply and at high prices, and a market alternately screaming and pleading for more castings, have continued to be major keynotes of the foundry industry during the past year. To meet this demand, ferrous foundries alone accounted for over 16,000,000 tons of castings weighing from a fraction of a pound to a record steel casting weighing 232 tons (14-128, June 1947).* Output, however, was generally curtailed by the lack of raw materials, and surveys indicate that foundry raw materials will continue to be short of the demand for at least another year (26-193, 26-194, 26-195, Jan. 1948). One year-end survey showed that less than 20% of gray iron foundries were obtaining their full requirements of pig iron (26-199, Jan. 1948). Shortage of pig iron forced the use of more scrap in cupola charges, bid up of the price of the limited amount of scrap which was available, and put additional technical burdens upon foundries trying to produce quality castings.

The shutting down of numerous blast furnaces for relining and repairs during the latter part of the year aggravated the already tight situation. Part of the hope for increased production of pig iron at the present time seems to hinge upon the possibility of operating present furnaces at higher pressures (2-255, 2-256, Dec. 1947). Two furnaces of Republic Steel Corp. operating at top pressures of about 10 psi. are reported to have shown an 11 to 20% increase in production with an attendant 13% decrease in coke consumption and a net saving of $1.00 per ton of iron since high-pressure operation was begun in Aug. 1946 (2-234, Nov. 1947).

Foundry coke also continued in insufficient supply and of variable quality. Some attention was given to the possibility of using anthracite as a substitute for coke and some excellent work was published to show that iron can be successfully melted in a cupola using anthracite alone or in combination with coke (16-122, Nov. 1947). Generally, however, foundries outside of the anthracite-producing regions have decided to struggle along with the present coke situation rather than revert to the melting practices of 1850. Development work on foundry coke has got off to a slow start because of the diversity of interests involved, but a definite beginning has been made on the fundamental problem of defining coke quality and determining the suitability of coke as a cupola fuel (14-215, Sept. 1947; 14-289, Nov. 1947). As might be expected from the shortness of supply, methods for melting with less coke have received considerable attention in the literature, but, for the most part, the attempt to save coke is being directed at more efficient operation rather than the use of substitutes (16-28, April 1947; 16-74, July 1947; 14-154, July 1947).

Nonferrous foundries have also found their operations curtailed and complicated by shortages in metallics, fuels, and pattern lumber—to mention only a few. These material shortages, with the attendant high costs, and the growing competition with other industries for suitable labor, have led foundries into a wide mechanization and modernization program in order to make the materials that they have go farther and to offer prospective employees more attractive working conditions. A major survey of foundry equipment covering more than 1500 foundries in the United States and Canada showed that over half of the mechanical equipment in these plants is less than five years old, and that mechanization is proceeding at an unprecedented and ever-increasing rate (14-74, April 1947).

Melting Practices

Low-cost low-pressure oxygen of about 98% purity at about 10% or less of the cost of cylinder oxygen has been one of the most promising recent technological developments. Interest has been so keen that virtually every issue of the various iron and steel trade magazines now contains some reference to the use of low-cost oxygen in openhearths or electric furnaces (2-141, 2-142, 2-143, Aug. 1947; 2-219, 2-220, Oct. 1947; 2-237, Nov. 1947). The interest has been contagious and foundrymen are eyeing oxygen as a possible method for increasing production or control of cupola-melted irons.

A few unpublished tests are in progress and more are being planned every day. Bremer (*Foundry*, Jan. 1948, p. 128) reports that in one series of tests, addition of about 8% oxygen to the cupola blast increased the tapping temperature, increased melting rate, and gave cleaner melting, but that the use of 15% oxygen interfered with uniform operation. Another news note (*Iron Age*, Jan. 29, 1948, p. 55) states that oxygen enrichment amounting to 5% of the blast rate produced tapping temperatures of 3000° F. even though an inferior grade of coke was used, and that metering of the oxygen into the blast provides a method for accurate temperature control of the iron. As tests of this type are continued, and begin to be reported in more detail in the literature, it will be possible to evaluate more accurately the future of this new raw material.

Nonferrous melting practice has been characterized recently by the increasing use of low-frequency induction furnaces. Larger and faster furnaces of this type are being developed (25-24, March 1947) because of their high recovery, the absence of products of combustion, good temperature control, and the rotary motion of the melt which reduces segregation and improves mixing (16-34, April 1947). One furnace of this type is reported to be producing recoveries as high as 96% in remelting aluminum alloy chips for recasting into forging blanks (15-29, Oct. 1947).

Techniques utilizing melting and pouring under high vacuum are facilitating the production of high-purity metals which contain easily oxidizable and expensive constituents. It has been shown on a production scale that alloys produced by vacuum melting exhibit unique properties which adapt them for high-temperature applications. As the adverse effects of gases in metals become better realized, foundries may well develop an increasing interest in the use of vacuum melting for the sensitive alloys (14-117, May 1947; 11-86, Aug. 1947; 11-147, Nov. 1947).

British experiments with basic-lined cupolas have been watched with

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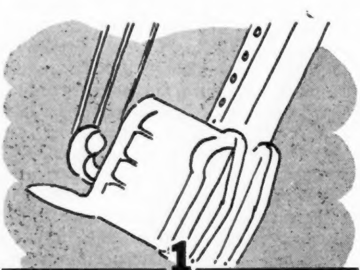
*Literature references are cited by the corresponding item number in the *Review of Current Metal Literature* instead of repeating entire title, author, and source; this information can be obtained by referring to *Metals Review* for the month indicated.

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received in the Library of Battelle Memorial Institute, Columbus, Ohio, During the Past Month



1 ORE BENEFICIATION

1a—General

1a-10. Past Progress and Future Aims in Mineral Dressing. George H. Roseveare. *Mining Congress Journal,* v. 34, Feb. 1948, p. 54-57.

1a-11. Radioactive Tracers; How They Can Be Used in Flotation Research. *Engineering and Mining Journal,* v. 149, March 1948, p. 53-55.

Details of some techniques being applied at M.I.T. by A. M. Gaudin and co-workers. Carbon 14 is used to trace the movements of flotation reagents, or their ions, among the several phases or products of a flotation operation.

1b—Ferrous

1b-6. Georgia Iron Deposits, Cherokee, Bartow, Floyd, and Polk Counties. Part I. Walter T. Lewiecki. *Bureau of Mines, Report of Investigations No.* 4178, Jan. 1948, 28 pages.

Test results on ore samples.

1c—Nonferrous

1c-22. Sur Quelques Cétones Bornyliques. (Remarks Concerning the Separation of Vanadium From Boron.) Georges Weiss and Pierre Blum. *Bulletin de la Société Chimique de France,* Nov.-Dec. 1947, p. 1077-1079.

A method of separation based on the insolubility of barium vanadate in the presence of an excess of barite, and the solubility of barium borate under the same conditions. Application to a mixture of vanadium boride and oxides.

1c-23. Treatment of Tin-Silver Ore; Sociedad Minera Pirquitas, Picchetti y Cia., S. A. Argentina. *Deco Trefoil,* v. 12, Jan.-Feb. 1948, p. 5-12.

Flow diagram.

1c-24. Antimony Deposits in Alaska. Norman Ebbley, Jr. and Wilford S. Wright. *Bureau of Mines, Report of Investigation No.* 4173, Jan. 1948, 43 pages.

Results of some beneficiation tests.

1c-25. Yakobi Island Nickel Deposit; Sitka Mining District, Alaska. J. H. East, Jr., W. M. Traver, Jr., R. S. Sanford, and W. S. Wright. *Bureau of Mines, Report of Investigations No.* 4182, Jan. 1948, 29 pages.

Results of beneficiation tests using bulk flotation and differential flotation of copper and nickel.

1c-26. Knob Hill Mine Prospers on Newer Ore Discoveries. John B. Huttl. *Engineering and Mining Journal,* v. 149, March 1948, p. 56-59.

Geology and mining, milling, and concentration methods used at above gold-silver mine in north-central Washington. Flow sheet.

1d—Light Metals

1d-4. Technology of the Extraction of Alumina From Ferrous Clays. (In Russian.) Ya. Ya. Dobonov, G. V. Medoks, and E. M. Soshestvenskaya. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 20, Sept. 1947, p. 870-874.

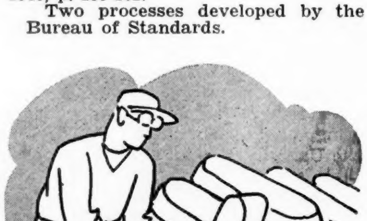
A new variation of the sulphuric acid method for treatment of ferrous clays containing 18 to 20% Al_2O_3 resulted in a satisfactorily pure alumina in 63% yield. Heating with excess soda was unsatisfactory. 17 ref.

1d-5. Flotation of Beryllium Ores. J. S. Kennedy and R. G. O'Meara. *Bureau of Mines, Report of Investigations No.* 4166, Jan. 1948, 18 pages.

Work done in recovering pure metal from domestic deposits, and in the improvement of present metallurgical practice.

1d-6. Aluminum From Clay. *Journal of Chemical Education,* v. 25, March 1948, p. 159-162.

Two processes developed by the Bureau of Standards.



2 SMELTING, REDUCTION and REFINING

2a—General

2a-5. Vacuum Melting Techniques. J. D. Nisbet. *Iron Age,* v. 161, March 18, 1948, p. 79-82, 122.

Rigid purity specifications, particularly with respect to contamination by nonmetallic constituents require use of vacuum in the melting of many high-temperature alloys and of metals such as tungsten, molybdenum, chromium. Procedures for degassing molten metal involving the use of carbon and hydrogen. Problems usually encountered in vacuum-melting work.

2b—Ferrous

2b-38. Bunched Openhearth Heats and Suggestions for Their Prevention. Robert K. Harris. *Blast Furnace and Steel Plant,* v. 36, Feb. 1948, p. 205-211.

An extended description of scheduling methods used to prevent "bunching" of the heats which results in alternate periods of rush and slack work at the floor laboratory, main laboratory, openhearth pit, stripper, soaking pits, moldyard, stockyard, floor, and blast furnace.

2b-39. Oxygen Uses in Steel Production. *Industrial Heating,* v. 15, Feb. 1948, p. 262, 264, 266.

Reviews paper by J. H. Zimmerman. (Presented at recent A.I.S.E. meeting, Pittsburgh.)

2b-40. Oxygen Uses in Steel Production. J. H. Zimmerman. *Iron and Steel Engineer,* v. 25, Feb. 1948, p. 35-43; discussion, p. 43-44.

Summarizes much of the development and research work which has been done on the use of oxygen in the openhearth. (Presented at A.I.-S.E. Annual Convention, Pittsburgh, Pa., Sept. 23, 1947.)

2b-41. Difficulties Involved in Producing Sound Ingots. Robert L. Stephenson. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 158, 160.

Fundamental factors and experimental results. The most important factors are said to be chemical composition of the steel and time from finish pour to charge in the soaking pits or "track time". Structures formed on solidification and phase transformations. (Condensed from paper presented to 5th Annual Conference on Electric Furnace Steel, A.I.M.E., Pittsburgh, Dec. 4, 1947.)

2b-42. The Mineralogy of Basic Openhearth Slags. J. L. Mauthe and K. L. Fetters. *Yearbook of the American Iron and Steel Institute,* 1947, p. 264-297; discussion, p. 297-298.

Reviews and correlates some of the more important data from the literature and gives a few examples of the application of mineralogy to openhearth slags. 28 ref. (Presented at A.I.S.I. meeting New York, May 21-22, 1947.)

2b-43. New Process to Make Specialized Alloy Steels. *Petroleum Engineer,* v. 19, Feb. 1948, p. 92.

Electric ingot method for continuous metal casting developed by M. W. Kellogg Co. Alloying elements are continuously fed at a controlled rate into an electrical apparatus from which air is excluded, and in which an ingot of any desired analysis is produced by progressive solidification.

2b-44. Some Effects of Melting Practice on Properties of Medium-Carbon Low-Alloy Cast Steel. J. G. Kura and N. H. Keyser. *American Foundrymen's Assoc., Preprint No.* 47-4, 1947, 12 pages.

Notched-bar impact properties and hardenability of medium-carbon, Mn-Mo cast steels produced by eight

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FOUNDRY PRACTICE

interest in this country, where acid linings are used exclusively (14-163, 14-164, July 1947). The advantage of the basic lining is that it permits a basic slag which can be used for desulphurization or dephosphorization during melting. The results of these experiments have not yet been convincing enough to lead to a wholesale change-over to the basic lining even in England where pig iron, scrap, and coke are inferior to those in this country. Major disadvantages of the process seem to be that desulphurization and dephosphorization cannot be carried out simultaneously, the basic linings are relatively expensive, and suitable basic patching materials have not been developed. The British experiments were of an operating nature and did not include the effects of basic practice upon the properties or structure of the iron.

Pouring Practices

Foundry pouring practices continue to develop principally through increased use of mechanical equipment. The trend is illustrated by a description of a mechanical pouring unit that permits one operator to pour 370 brake shoe molds an hour by means of remote pushbutton control (14-327, Jan. 1947).

The use of necked-down risers has been extended considerably and preformed riser cores in a variety of standard shapes are on the market (14-30, Feb. 1947). The principal use of knock-off or necked-down risers has been in the steel foundry where easy removal of large risers is of considerable economic importance. Exothermic riser compounds and exothermic core mixtures, which were introduced about two years ago, are also finding wide application in specific foundries which have taken the trouble to investigate their advantages, although many foundries have not yet investigated their interesting possibilities for improving soundness and for increasing yield by reducing riser heights (14-329, Dec. 1947).

The Wetherill counter-gravity casting process developed at Armour Research Foundation (14-58, March 1947; 14-341, Jan. 1948) consists of sucking molten steel under controlled pressures below atmospheric into the bottom of molds so as to reduce turbulence and dirt and gas entrapment. Advantages of the process are said to include the casting of thinner sections than possible by conventional methods, and reduction of losses from such factors as porosity and inclusions. Although these advantages are of considerable interest to foundrymen, commercial development of the process is retarded by economic considerations.

A novel method of pumping molten metals of high melting point was reported by Tama (14-365, Jan. 1948). An induction furnace is used as the pumping unit. A refractory pipe is inserted into the secondary circuit of the furnace where a high pressure is created by the secondary current. The other end of the pipe leads to the outside of the furnace and serves as a pouring spout or nozzle by which the molten metal is transferred to the mold. Separate controls are provided for regulating the temperature of the metal and for pumping. Pumping may be continuous at any desired rate or may be discontinuous and timed to discharge metal as molds are received. The process can be placed under highly sensitive electrical control. The possibility of using the induction furnace merely as a pump which is supplied with molten metal from another melting unit (such as a cupola) opens the door to conjecture about many interesting applications that may be developed around this unit in the future.

Molding and Coremaking

Chemically coated sands—first introduced to the industry last year—have been restricted in commercial application to gray iron molding sands, but extension of the treatment to core sands and to molding sands for other metals is receiving attention. The process consists of coating washed silica sands with a thin film of high-carbon resin. After the coating is suitably set on the sand grains, the sand is mixed in conventional fashion with the addition of bentonite, cereals, water, and a water-soluble chemical (14-186, Aug. 1947). Significant benefits have been reported by a large production foundry, and the sand is being used in a number of foundries in regular production (14-127, June 1947). Advantages claimed include markedly higher flowability, better casting finish, and lower cleaning costs.

Harold W. Lownie, Jr., Research Engineer in the Process Metallurgy Division, Battelle Memorial Institute, Is Assigned to the Broad Development Program of the Gray Iron Research Institute. He was a foundry engineer for Westinghouse Before Joining the Battelle Institute Staff in 1945

The increasing use of core blowers and development of suitable sands for core blowing is merely another manifestation of the tendency to carry foundry mechanization as far as possible so as to obtain the maximum output per man and to improve working conditions. Suitable mainly for mass production coremaking (14-224, Sept. 1947), core blowers are being installed at a considerably higher rate than the limited literature on the subject would indicate.

The venting of molds is a frequent subject of discussilon among steel foundrymen. The use of vents is generally handled empirically. Recently, Adams advanced the idea that venting is more of a tradition than a necessity, and stated that savings up to $10 per ton have resulted from the elimination of venting in jolt-squeeze and snap-flask work (14-97, May 1947; 14-158, July 1947). Troy carried out the same theme by stating that mold gas pressures are apparently considerably overrated; there is no supporting evidence to show that venting of molds for steel castings serves any function other than to increase costs and to complicate the molding procedure. Troy states further that in the large steel foundry with which he is associated, no venting has been used for over two years (14-318, Jan. 1947).

Pushbutton molding appears to be the next forthcoming major development in molding equipment. Machines that are "automatic" today may fall practically into the class of hand operations within the next few years. In one such new machine (14-293, Nov. 1947), pushing of one button actuates a motor-driven control unit which operates a series of pneumatic valves in any desired sequence and with any desired time interval to fill the flask with sand, jolt, squeeze, vibrate, and draw the pattern. Advantages of this type of equipment are three-fold; one or two operators can service a battery of, say, eight machines; molds are rammed uniformly at a predetermined rate; and relatively untrained operators can be used. Other more advanced designs depending mainly upon electrical control of all molding operations are in experimental use and can be expected to hit the trade press as soon as the bugs are worked out.

Synthetic resin core binders with their faster baking times, lower bak-

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different melting practices. The principal influence of melting practice on the properties appeared to be through control of sulphur content and sulphide distribution. Some variations in hardenability could not be accounted for by chemistry. However, no distinct or consistent influence of any one type of melting or deoxidation practice on hardenability was apparent.

2b-45. Slag Control in the Acid Electric Furnace. H. H. Johnson, M. T. McDonough, and D. L. Radford. *American Foundrymen's Assoc., Preprint No.* 47-19, 1947, 12 pages.

Results of a study of some of the characteristics of acid electric furnace slags, together with some applications of these characteristics to serve as a guide for such furnace practice. 10 ref.

2b-46. Cupola Melting Phenomena. E. V. Somers and D. W. Gunther. *American Foundrymen's Assoc., Preprint No.* 47-51, 1947, 6 pages.

Results of this investigation determine the variation of both chemical and physical properties of iron with a charge of constant composition and variation of physical properties with tapping temperature at constant chemical composition of the iron plus a constant percentage of inoculating addition.

2b-47. Oxygen in the Bessemer Converter. *Iron Age,* v. 161, Feb. 19, 1948, p. 70. Based on condensed translation from *Engineers' Digest* (American Edition), v. 4, Nov. 1947, p. 522-523.

Previously abstracted from latter source. See item 2-303, R.M.L., v. 4, 1947.

2b-48. Stresses Optimum Conditions for Economy and High Production. *Steel,* v. 122, Feb. 23, 1948, p. 115.

Outlines talk by Karl L. Fetters entitled "Slag Control in the Economics of Steel Production", which summarized the chemistry, mineralogy, control, and operating significance of basic openhearth slags. (Presented to Pittsburgh Chapter, A.S.M., Jan. 8, 1948.)

2b-49. A Producao de Gusa em Altos Fornos Elétricos Pela Antiga Companhia Eletro-Metalurgica Brasileira, em Ribeirao Preto. (Electric Blast Furnace Production of Cast Iron By the Brazilian Electro-Metallurgical Co., Ribeirao Preto.) Martinho Prado Uchoa. *Boletim da Associacao Brasileira de Metais,* v. 3, Oct. 1947, p. 667-683; discussion, p. 683.

The production of cast iron by the method adopted in the above plant. Bessemer converters are linked with Ludlum electric furnaces and rolling mills.

2b-50. Apanahado de Varios Processos de Reducao em Fornos Elétricos em Face das Condicoes Brasileiras. (Suitability of Various Reduction Processes in Electric Furnaces to Brazilian Conditons.) *Boletim da Associacao Brasileira de Metais,* v. 3, Oct. 1947, p. 706-716; discussion, p. 717-718.

Reduction of Brazilian ores and production of cast iron, calcium carbonate, ferro-alloys, and aluminum in electric furnaces. Characteristics of the Tysland-Hole furnace and use of Soderberg electrodes. (A report prepared by the Norwegian firm, Elektrokemisk A/S, and then translated into Portuguese.)

2b-51. Method for Control of the Slagging Process in Openhearth Furnaces. (In Russian.) Iu. I. Usatenko. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Dec. 1947, p. 1430-1434.

New method is based on determination of the alkalinity of water-alchol suspensions of the slags. Data show that basicity of the slags has a definite relationship to the alkalinity of the suspensions.

2b-52. Zur Kenntnis der Reduktion von Eisenoxyden mit Wasserstoff und Kohlenmonoxyd. (Contribution to Study of the Reduction of Iron Oxides With Hydrogen and Carbon Monoxide.) H. J. Liebu. *Schweizer Archiv fuer Angewandte Wissenschaft und Technik,* v. 14, Jan. 1948, p. 1-19.

Part I compares the action of the two gases in the reduction of ferric oxide and the effects of various physical properties such as grain size, porosity, method of preparation of the iron oxide, and current density. 62 ref. (To be continued.)

2b-53. High Top Pressure Operation. James Review. *Iron and Steel,* v. 21, Feb. 1948, p. 45-47.

A digest of recent literature concerning operation of blast furnaces at top pressures above atmospheric.

2b-54. Lean Ores; Why Not a Departure From Tradition? *Iron and Steel,* v. 21, Feb. 1948, p. 55-56.

A method based on thermochemical considerations of using lean ores more economically than in the blast furnace, as a process complementary to blast-furnace practice.

2b-55. Making Merchant Pig Iron at Duluth in Winter Entails Starting With Frozen Iron Ore. *Skillings Mining Review,* v. 36, Feb. 14, 1948, p. 1.

Unique year-around operations of Interlake Iron Corp.

2b-56. Basic Openhearth Slag Control. Part VI. Relationship of Mineralogical Composition and the Appearance of the Slag Pancake. Charles R. Funk. *Blast Furnace and Steel Plant,* v. 36, March 1948, p. 332-336.

2c—Nonferrous

2c-16. Copper Smelting; Plant and Operations at the Mufulira Smelter. F. E. Buch. *Metal Industry,* v. 72, Feb. 6, 1948, p. 107-108.

Previously abstracted from *Metals Technology,* v. 14, Dec. 1947, T.P. 2248. See item 2c-1, Feb. 1948.

2c-17. Gas Absorption Phenomena and Degasification of Cast Monel. Bernard N. Ames and Noah A. Kahn. *American Foundrymen's Assoc., Preprint No.* 47-45, 1947, 15 pages.

Studies the effect of various deoxidation treatments of cast Ni-Cu alloys melted in indirect and resistor furnaces. Magnesium is shown to be inadequate as a degasser. In the indirect arc furnace, titanium, lithium and zirconium deoxidation yielded satisfactory results. Detrimental effects of nitrogen and hydrogen and use of Ti, Li, or Zr to prevent nitrogen porosity and of Ti to minimize hydrogen porosity. Comparative effects between the keel-block test bar and another test bar in reflecting metal quality.

2c-18. The Development and Introduction of a New Process for the Economic Recovery of Minute Quantities of Gold From Lead-Silver Bullion Derived From the Bawdwin Ores. Walter Frayne. *Bulletin of the Institution of Mining and Metallurgy,* Feb. 1948, p. 1-11.

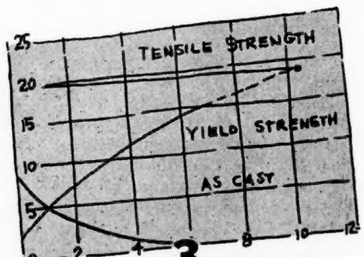
Nanita smelting works of Burma Corp., Burma, produces Pb, Ag, Zn concentrates, Cu-Pb matte Ni-Co speiss, and refined antimonial Pb. Each product contained small percentages of Au which was not recovered. Gold-zincing was found to be uneconomic. Study of the Pb-Zn-Ag system led to development of a commercial process for recovery of gold based on the fact that the gold becomes concentrated in the Ag-Zn crust during the Parkes process, thus reducing the amount of material to be treated from 6000 to 250 tons per mo. Experimental data from laboratory and pliot-plant work and from the resulting commercial process. The results also indicate a method for enrichment of Parkes retort bullion on similar material with a sufficiently low Zn content which would not entail use of very high temperatures and, therefore, would require little in the way of special equipment.

2c-19. Determination of Calcium Vapor Pressure in the Thermal Production of Calcium Metal. L. M. Pidgeon and J. T. N. Atkinson. *Canadian Mining and Metallurgical Bulletin,* v. 41, Jan. 1948, p. 14-20.

The production of metallic calcium, by reduction of lime with aluminum, was investigated. Using a modified form of the effusion method, the vapor pressure of càlcium above the reaction was determined and found to vary from 1.0 to 1.3 mm. Hg from 1150° to 1200° C. It is believed that the reaction consists of reduction of lime with aluminum vapor. 11 ref.

For additional annotations indexed in other sections, see:

14a-41; 15c-2; 16a-20; 16b-20-27; 19b-26; 21c-3; 26a-29; 27b-22.



3 PROPERTIES

3a—General

3a-21. Statistical Aspects of Fracture Problems. Benjamin Epstein. *Journal of Applied Physics,* v. 19, Feb. 1948, p. 140-147.

In recent years there has been an increasing interest in the development of statistical theories of strength. A main aim of these theories is to explain such things as dependence of strength of specimens on volume or length. It is pointed out that the problems posed by these models are equivalent to an important problem in mathematical statistics and that the calculations made by mathematical statisticians give a far more complete description of the results to be expected than do the estimates found up to now in the technical literature. 15 ref.

3a-22. A Neglected Problem in Physical Metallurgy. Michael G. Corson. *Metal Progress,* v. 53, Feb. 1948, p. 248-249.

Existing values of E and G (moduli of elasticity in pure tension and pure shear, respectively) for 11 metals vary more than 10% from the average value in 9 of 22 citations in "Handbuch der Physikalischen und Technischen Mechanik". Questions validity of the theoretical relationship among E, G, modulus of elasticity in uniform compression (K), and ratio of radial contraction to axial elongation in pure tension ψ. It is thought possible that E and ψ are not even true constants. Also

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ing temperatures, faster collapsing, and high moisture resistance in the cured state are gradually picking up new advocates in heavy-metal founding (14-7, Feb. 1947; 14-316, Dec. 1947). Another advantage of these binders is that production lots of cores can be efficiently and economically cured by high-frequency dielectric heating (14-33, Feb. 1947; 14-178, Aug. 1947). Unfortunately for jobbing foundries, however, the difficulties of applying dielectric heat to small lots of different sizes of cores have not yet been suitably solved.

The results of an excellent and thorough investigation of the behavior of molding sands in contact with molten steel were presented by Caine (14-179, Aug. 1947). Sand specimens were immersed in molten steel and their behavior correlated with behavior in production molds. In over 5000 separate tests, the method was found capable of differentiating between behavior of sands that are known to be acceptable or unacceptable in production. The test showed up differences between sands rammed to different densities, between green sands of varying moisture contents, between green and air-dried sands, and between new and reclaimed sands. A large variety of organic additions were also studied, indicating that judicious combinations of such additions, each added to impart a specific property, should be economically advantageous. The test method proposed by Caine is so straightforward, simple, and informative that wide application in future sand studies can be expected.

Investigating the effect of mold materials on the gas absorption of 85-5-5-5 alloy, Eastwood and Kura report that this alloy is not particularly sensitive to either the moisture content or permeability of green sand molds. (14-297, Nov. 1947). The theory that water forms a protective oxide skin on the metal through which hydrogen is not readily absorbed was supported by the finding that more gas was absorbed from molds baked at moderate temperatures than from green sand molds. Essentially no gas was absorbed, however, from molds dried at temperatures high enough to remove all combined water.

Patternmaking

Patternmaking developments have been characterized mainly by the increasing use of metal patterns, plastic patterns, and gypsum molds. Plastic patterns have been found quite satisfactory in many applications where their low initial cost, durability, and ease of reproduction are major factors (14-18, Feb. 1947; 14-152, July 1947; 14-181, Aug. 1947).

Although gypsum has been used for some time as a mold material for nonferrous alloys (14-102, May 1947), its use in patternmaking to check core boxes, to correct patterns for metal shrinkage, provide pattern stock, make follow boards, and for other applications is on the increase (14-36, March 1947).

Special Processes

The main trend during the last year in precision casting has been a more realistic attitude toward the process (14-330, Dec. 1947). It is now realized that precision castings (or investment castings) have a definite place in the industry for small high-production items of certain characteristics, but that the process has definite limitations as to casting sizes and tolerances. Overly enthusiastic claims made during the days of hectic wartime production have been considerably discounted and further refinements are being sought so that the limited range of castings to which the process is particularly adapted can be economically produced.

The Croning process utilizes clean silica sand, a special phenolic resin binder, and no water (14a-9, Feb. 1948). The sand is dropped onto a heated metal pattern. After about 6 sec. a firm layer of sand about ⅛ in. thick forms against the pattern and the excess sand is poured off for re-use. The pattern and adhering sand are baked for about 3 min. at 550° F. to convert the bond to a hard, insoluble plastic. After the sand shell is stripped from the pattern, halves are pasted together, suitably supported in a box, and poured in the conventional manner. Advantages are claimed to be high mold permeability, excellent casting finish, good dimensional tolerance, and high collapsibility. High production is possible with no molding machines, and the molds can be stored for a long time, since they have no affinity for water. The process has been used in Germany for cast iron, cast steel, and aluminum, mainly to produce pipe fittings with cast threads.

The possibility of working cast iron is always of some interest. German investigations on the hot rolling of cast iron conducted to determine the feasibility of producing piston rings from rolled cast iron have been reported by Piwowarsky (19-47, 19-54, March 1947). He found that white cast irons could be readily put through grooved rolls at about 1800° F. with an accompanying increase in tensile strength from about 60,000 psi. to about 140,000 psi. as rolled, with 70% deformation. Elongation simultaneously increased from practically zero to about 2%. The presence of graphitic carbon, however, materially interfered, and gray cast irons were judged not suitable for rolling in grooved rolls.

Casting Inspection

Casting layout and inspection can be facilitated by means of optical projection of drawings and charts directly onto the surface of the castings (24-247, Sept. 1947). The method is in commercial use (12-97, July 1947).

A new method of nondestructive testing of ferrous and nonferrous castings—supersonic testing—can detect and determine exactly the location of defects in rolls up to 18 ft. long (12-151, Sept. 1947). Supersonic waves above 20,000 cycles are directed into the part to be tested and the pattern obtained on an oscilloscope screen provides a visual indication of the location of defects (12-202, Jan. 1947). Two general methods are in use, one based on the time required for the vibrations to pass entirely through the piece and to be picked up on the other side (somewhat analogous to X-ray examination), and the second based on the time required for the vibrations to be reflected back from a defect or from the far side of the piece (somewhat similar to radar detection) (12-165, Oct. 1947).

Casting defects charts of considerable value and importance have emanated from three sources during the past year. The Institute of British Foundrymen has published its Atlas of Casting Defects (27-42, March 1947), the French have published the International Dictionary of Foundry Defects (14-92, May 1947), and the American Foundrymen's Association has recently issued its Analysis of Casting Defects.

Metal Properties

Developments in metal properties have far-reaching effects upon the processes and equipment used in the foundry. A valuable contribution to knowledge on the solidification of metal is Schaum's study of convection currents existing in cast iron solidifying in sand molds (14-253, Oct. 1947). This work shows that convection currents function in the liquid iron until bridging dendrites interfere. Convection currents, therefore, are of more importance in iron casting than in steel casting, since iron is usually poured with more superheat above the liquidus, thus giving the convection currents more time to operate. Schaum's work is of considerable practical significance because it demonstrates that within reasonable limitations gray iron castings will solidify from the bottom up, independent of any gating system. Therefore, when convection currents are sufficiently active to carry

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considers the problem of pure tension, pointing out that there is no way for loading either a test bar or a structural member in that manner. A tentative formula of ratio of surface stress to average stress is derived and research on effects of alloying and working on compressibility is suggested.

3a-23. Plastics in Business Machines. R. G. Chollar. *Modern Plastics,* v. 25, Feb. 1948, p. 111-115.

Eight typical business-machine-part applications which illustrate factors involved in substitution of plastics for metals in small parts. Comparative mechanical, physical, electrical, and chemical properties of nine common plastics and of steel, aluminum, magnesium, and zinc.

3a-24. The Rupture Test Characteristics of Heat Resistant Sheet Alloys at 1700 and 1800° F. J. W. Freeman, E. E. Reynolds, and A. E. White. *National Advisory Committee for Aeronautics, Technical Note No.* 1465, Feb. 1948, 61 pages.

The materials studied included the standard Cr-Ni types 330, 310, 310 S, and four experimental alloys containing Co, Mo, W, and B in addition to Ni and Cr.

3a-25. Sleeve Bearing Metals. C. H. Hack. *National Lead Co. Research Laboratories,* Brooklyn, 43 pages.

Various types and compositions. Mechanical, physical, and chemical requirements. (This paper will be included in "Encyclopedia of Chemical Technology", to be published by Interscience Encyclopedia, Inc., N. Y.)

3a-26. A Simple Theory of Static and Dynamic Hardness. D. Tabor. *Proceedings of the Royal Society* (Series A), v. 192, Feb. 4, 1948, p. 247-274.

When a spherical indenter is pressed into a softer metal, plastic flow occurs. The permanent indentation is spherical in shape, but its radius of curvature is greater than that of the indenter. This is believed to be due to release of elastic stresses. If recovery is truly elastic it should be reversible and a second application and removal of the indenter under the original load should not change the size or shape of the indentation. Experiments show that this is true and that there is close agreement between the observed deformation and that calculated from Hertz's equations. The energy involved in elastic recovery is found to account for the energy of rebound of the indenter. This analysis explains a number of empirical relations observed in dynamic-hardness measurements, and also the calibration characteristics of the rebound scleroscope. The results also show that dynamic hardness of very soft metals is very much higher than static hardness and indicates that forces of a quasi-viscous nature are involved. Finally, a simple theory of hardness based on the theoretical work of Hencky and Ishlinsky is presented. It is shown experimentally that for a material incapable of appreciable work-hardening, the mean pressure required to produce plastic yielding is related to the elastic limit by an empirical relationship. 27 ref.

3a-27. The Flow of Metals Under Various Stress Conditions. A. L. Nadai. *Institution of Mechanical Engineers, Proceedings,* v. 157, War Emergency Issue No. 28, 1947, p. 121-160.

Means for dealing with finite strains of an order of 10 to 100 or more times larger than strains that can be sustained elastically. Certain new types of strains are introduced. Several ideal substances, representing behavior of metals or other materials under different conditions. For a perfectly plastic substance a special solution is given for a plane problem and for plastic shells with rotational symmetry. A case of creep of metals at elevated temperatures. Experiments on propagation of the plastic zone along mild-steel bars under tension, on flow of copper and of medium carbon steel under combined stresses in the strain hardening range (including description of the fractures which were observed), and experiments on effect of speed of deformation of these metals at normal and elevated temperatures over a wide range of strain rates.

3a-28. Abrasion, Erosion and Corrosion. *Chemical Age,* v. 58, Feb. 7, 1948, p. 207. Condensed from paper by C. H. Desch.

Reviews progress in the study of metal surfaces. (Presented to Chemical Engineering Group, Society of Chemical Industry.)

3a-29. Wear and Defects of Engine Bearings. F. Picard. *Engineers' Digest,* v. 5, Feb. 1948, p. 73-74. Translated and condensed from *Le Genie Civil,* v. 124, June 15, 1947, p. 233-235.

Derives a new coefficient of wear and defines more closely certain specified defects of bearings.

3b—Ferrous

3b-31. Some Properties of Low Carbon 8½% Nickel Steel. T. N. Armstrong and G. R. Brophy. *International Nickel Co.,* 12 pages.

The increasing use of subzero temperatures in many industries and the advantages of storing gases in the liquefied state, have stimulated much interest in the development of materials resistant to brittle behavior at low temperatures. Such a material should be moderately priced and readily fabricated by the usual methods. These needs resulted in development of the steel whose properties are described. While it was developed primarily for low-temperature service, it is already being adopted for other uses where low temperatures are not involved. Prospective applications. (Presented at National Conference on Petroleum Mechanical Engineering of A.S.M.E., Houston, Texas, Oct. 5-8, 1947.)

3b-32. Acicular Cast Irons. *American Foundryman,* v. 13, Feb. 1948, p. 41-48. Condensed from 4th Report of Research Committee on High-Duty Cast Iron for General Engineering Purposes, Institution of Mechanical Engineers, London, by J. G. Pearce.

Previously abstracted from condensation in *Engineering,* v. 164, Dec. 19, 1947, p. 596; Dec. 26, 1947, p. 607-608. See item 3b-7, Feb. 1948.

3b-33. Cast Iron Offers Combination of Properties Not Found in Other Materials. Nelson G. Meagley. *Materials & Methods,* v. 27, Feb. 1948, p. 83-86.

Engineering properties, working characteristics, and corrosion resistance to different media.

3b-34. The Behavior of the Lattice of Polycrystalline Iron in Tension. W. A. Wood. *Proceedings of the Royal Society* (Series A), v. 192, Feb. 4, 1948, p. 218-231.

Stress-strain characteristics were investigated for two distinct types of lattice planes in specimens of Swedish iron in tension. Earlier observations that the metallic lattice under stress ceases to conform with Hooke's law when external plastic deformation occurs are confirmed, but deviation differs in the two cases. The elastic range for the (211) spacing appears to be greater than for the (310) spacing. On removal of stress in excess of the "lattice yield", the two types of spacing show a residual strain of opposite sign to the strain under stress, but the magnitude is different.

3b-35. An Appraisal of Hardenability Band Specifications for Alloy Steel. D. H. Ruhnke. *Yearbook of the American Iron and Steel Institute,* 1947, p. 580-590; discussion, p. 591-596.

Results of heats made on the basis of hardenability tests and reported to the Alloy Technical Committee since the introduction of H-bands in July, 1944. (Presented at A.I.S.I. meeting, New York, May 21-22, 1947.)

3b-36. Occurrence of Intergranular Fracture in Cast Steels. C. H. Lorig and A. R. Elsea. *American Foundrymen's Assoc., Preprint No.* 47-2, 1947, 14 pages.

Causes of a peculiar smooth undulating fracture in test bars of some cast steel specimens. Several causes of this phenomenon are advanced.

3b-37. Bearing Steels Meet High Quality Standards. E. M. Taussig and C. B. Cobun. *Steel,* v. 122, Feb. 23, 1948, p. 100, 103.

3b-38. Rail Failure Statistics. W. C. Barnes, C. B. Bronson, and L. T. Nuckols. *American Railway Engineering Association, Bulletin,* v. 49, Feb. 1948, p. 383-397.

Data reported by cooperating railroads.

3b-39. The Physics of Sheet Steel. (Continued.) G. C. Richer. *Sheet Metal Industries,* v. 25, Feb. 1948, p. 303-308.

This installment discusses translational magnetism and 180° reversals. (To be continued.)

3b-40. Boron-Treated Steels. *Blast Furnace and Steel Plant,* v. 36, March 1948, p. 345-346, 362; *Steel Processing,* v. 34, March 1948, p. 144-146. Based on Technical Report 1175, National Bureau of Standards.

Extensive experimental program conducted during the war at the National Bureau of Standards under the auspices of the War Metallurgy Committee, National Research Council. Included were a study of interrelationships between boron, carbon, and other alloying constituents on properties of steels made both in the laboratory and commercially; and development of spectrographic and chemical methods for accurate determination of boron in steel.

3c—Nonferrous

3c-7. Etude de l'Energie Magnetocristalline des Composés Definis MnBi et Mn_2Sb. (Study of Magnetocrystalline Energy of the Definite Compounds MnBi and Mn_2Sb.) Charles Guillaud. *Journal des Recherches du Centre National de la Recherche Scientifique,* 1946, p. 27-33.

Determination of magnetic properties of monocrystalline Mn_2Sb and MnBi in the range 20° K. to room temperature.

3c-8. Preparation d'Alliages Binaires du Manganese et Détermination de Leur Diagramme en Utilisant Principalement les Proprietés Ferromagnetiques. (Preparation of Binary Alloys From Manganese and Determination of Their Diagram, Using Principally Their Ferromagnetic Properties.) Charles Guillaud. *Journal des Recherches du Centre National de la Recherche Scientifique, No.* 1, 1947, p. 15-21.

Commercial manganese was purified to 99.99% for use in making alloys for this study. Mn-Sb, Mn-As,

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FOUNDRY PRACTICE

most heat to the top of the casting, top risers should be used; side risers are not desirable because directional solidification toward the risers will not be obtained.

For the production of cast iron with a nodular form of graphite instead of the usual flake form, the British Cast Iron Research Association has reported a process which eliminates the use of involved treatments or special compositions (14-34, Feb. 1947). The product is claimed to have high tensile strength, appreciable ductility, and shock resistance materially better than that of gray cast iron containing flake graphite. Morrogh and Williams, who are currently working on this process and studying the mechanism of graphite formation, used an interesting analogy method to point out similarities between graphite formation in nickel-carbon and cobalt-carbon alloys on the one hand, and the iron-carbon and cast iron systems on the other (4-59, June 1947; 4-149, Nov. 1947). These two papers, together with a recent book by Alfred Boyles of this country (27-133, Aug. 1947), represent an excellent summary of the present knowledge of graphite formation in cast iron.

Interest in controlling metal solidification in molds led to Russian work on the effect of supersonic waves on metal crystallization (4-16, March 1947). Still in embryonic form, the work has shown that exposure to supersonic waves during solidification caused zinc to crystallize with a more dendritic structure.

Gases and unsoundness in nonferrous alloys received considerable attention from the Brass and Bronze Ingot Institute which confined most of its published results to a study of 85-5-5-5 copper-base alloys (4-64, July 1947; 14-129, June 1947, and others). Hydrogen and oxygen are probable major sources of pinholes and microporosity, while the effects of carbon, carbon monoxide, sulphur, sulphur dioxide, and nitrogen appear to be rather uncertain. The importance of melting copper-base alloys in an oxidizing atmosphere and thoroughly deoxidizing before pouring was demonstrated.

Cooperative Activities

Cooperative activities within the foundry industry have continued at an encouraging rate. The research work of the Brass and Bronze Ingot Institute has already been mentioned. Divisional research committees of the American Foundrymen's Association are conducting specific research projects within various fields of activity for the benefit of the entire industry (14-109, May 1947), and standing committees of the A.F.A. have reported on various activities, including a study of unsoundness in light metal castings (14-78, April 1947). The Gray Iron Research Institute has published work dealing with the problem of foundry coke and cupola melting (14-215, Sept. 1947).

An industry-wide program of education has been undertaken by the Foundry Educational Foundation. Aimed at establishing a supply of foundry-conscious college-trained men, the Foundation has raised $280,000 by popular subscription within the industry to begin a three-year program, and has already subsidized 55 scholarships in six cooperating universities.

The growth of cooperative activities during the past several years is one of the most encouraging aspects of the foundry situation taken as a whole. Apparently increasing attention is being given to the proverb that if two friends get together and each gives the other a dollar, then each still has a dollar, but if two friends get together and each gives the other an idea, then each of them has two ideas.

The Reviewing Stand

THE SUBJECT OF punch-card filing for metallurgical literature continues to hold the focus of interest—this month's fan mail being about equally divided between that subject and some gratifying compliments on our new typographical appearance. In the March issue we broadcast a request for a code in which to break down or classify in detail the technical subjects in such fields as foundry, forging, machining and welding (a code similar to that published in the December issue of *Metal Progress* in conjunction with Messrs. Guy and Geisler's best-selling article on punch-card systems).

As a result of this request, we were able to pass on to our inquirer several suggestions that may be of interest to other readers as well. For instance, we are informed that the American Chemical Society has published a fairly lengthy and complete bibliography on the use of punch cards. Apparently this filing device has attracted the attention of well over 200 authors! Copies of this list of references are available at something like 75 cents each.

Also a Mr. Kenneth H. Fagerhaugh, librarian at the Research and Development Branch, Military Planning Division, O. Q. M. General, 2800 South 20th St., Philadelphia 45, has made quite an extensive (and intensive) study of punch-card systems, and no doubt could cite references on almost any desired classification.

The intelligence that fascinates us most of all, however, is that Wright Field has developed the system to the point where a request for information comes out as a photo-printed bibliography! Being of the old school that has always had to dig out information by the laborious and time-consuming search method (particularly onerous before the advent of the Review of Metal Literature), we marvel at these new methods of push-button education, and wonder how far such mechanization will eventually extend.

Now we understand a little better why the requests for help and information that salt the incoming mail of the American Society for Metals include such gems as "Please send me all the information you have about heat treating" and the all-time grand prize winner, "Please send me all the information you have about the subjects you have information on." Any reasonable request for help will be handled with a willing expenditure of time and effort, but doggone it, we don't have any pushbuttons.

By the way, can someone tell us what Nobilium is? Composition? Who makes it? M.R.H.

Mn-Sn, Mn-Bi alloys were prepared and their Curie points determined.

3c-9. A New Group of Strong, Conductive Copper Alloys. Harold A. Knight. *Materials & Methods,* v. 27, Feb. 1948, p. 76-79.

Properties and applications of Trodaloys, a group developed by General Electric. These and similar alloys are also produced and sold by several other companies under other trade names, including Beraloy, Mallory 100, Ampcoloy, Tuffalloy, Berylcos, Alloy W5. Alloying elements present in some or all of these are Co, Be, Cr, Ag, Ni, and Zr. They have the unusual combination of high strength, high electrical conductivity, high endurance limits, high impact resistance and high service temperatures.

3c-10. Sulphuric Acid Resistant Stainless Steel Now Available in Wrought Form. *Materials & Methods,* v. 27, Feb. 1948, p. 80-82. See also **Corrosion.** Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 40, Feb. 1948, p.87A-88A.

Properties and applications of Carpenter Stainless No. 20 which is a new form of Durimet 20 (available only in cast form). Future availability in sheet and plate form is expected.

3c-11. Blistering of Silver Plating at High Temperature. Carl F. Floe and M. B. Bever. *Metal Progress,* v. 53, Feb. 1948, p. 247-248.

Results of some experiments made to determine the cause of blistering on turbine and jet-engine parts. It was found that blistering required presence of oxygen or of water vapor at 800 and 1200° F. Tests at 1400° F. indicated that heating in nitrogen for a sufficient period removes hydrogen by diffusion, while, on heating in air, oxygen is adsorbed and forms water vapor by reaction with hydrogen. Believes that hydrogen and oxygen embrittlement are misnomers which should be replaced by "water-vapor embrittlement".

3c-12. Quantum Mechanical Calculation of the Heat of Solution and Residual Resistance of Gold in Silver. Kun Huang. *Proceedings of the Physical Society,* v. 60, Feb. 1948, p. 161-175.

An attempt is made to calculate the heat of solution of gold in silver on the basis of the quantum theory of metals. These two metals were chosen because they have the same atomic volume, and therefore are the simplest case. 0.15 ev. per atom was found for the heat of solution, which compares well with the observed value of 0.13 ev. Residual resistance was found to be 0.16 microohm per cm. for 1% solution. The considerable discrepancy as compared with the experimental value 0.38 seems closely connected with similar discrepancies found in other theoretical work on temperature resistances of the noble metals. 10 ref.

3c-13. Silver; A Survey of Its Production, Properties and Engineering Uses. Part III—Properties and Alloys. IV—Applications. (Concluded.) L. B. Hunt. *Metal Industry,* v. 72, Feb. 6, 1948, p. 103-105; Feb. 13, 1948, p. 123-127.

3d—Light Metals

3d-9. Die Aluminium-Silizium-Gusslegierungen—Giesstechnische und Mechanische Eigenschaften. (Cast Aluminum-Silicon Alloys—Castability & Mechanical Properties.) R. Irmann. *Metalen,* v. 2, Jan. 1948, p. 87-93.

Castability and mechanical properties of Al-Si alloys. Effects of varying percentages of silicon on the properties of the casting alloys.

3d-10. Investigations on Aluminum Alloys of High Strength at Room Temperature. B. W. Mott and J. Thompson. *Metal Treatment,* v. 14, Winter 1947-48, p. 227-238.

Results of a comprehensive investigation of the properties of wrought Al alloys, containing Mg, Zn, and Mn as the principal alloying elements. The tests involved determination of tensile properties, hardness, and resistance to fatigue and stress corrosion. 28 ref. (To be continued.)

3d-11. Aluminum Pipe and Tubing. Paul Brandt. *Heating and Ventilating,* v. 45, Feb. 1948, p. 83-86.

Data on properties to help evaluate the use of aluminum pipe for heating and ventilating work.

3d-12. Aluminum Foil. Part I—Its Properties for Packaging. Junius D. Edwards and D. B. Strohm. *Modern Packaging,* v. 21, Feb. 1948, p. 143-147, 192, 194.

Mechanical properties, water-vapor transmission rates, reflectivity for light and radiant heat, hygienic characteristics, resistance to corrosion, and other vital information.

3d-13. Examen de Cables Conducteurs en Almélec et en Aluminium-Acier Déposés Apres 15 a 25 ans de Service. (Examination of Conductor Cables of Almelec and Aluminum Steel Removed After 15 to 25 Years in Service.) Jean Herenguel. *Revue de l'Aluminium,* v. 24, Dec. 1947, p. 357-260.

Almelec cables examined after long-time service showed good corrosion resistance to atmospheric effects and no changes in mechanical strength. This aluminum alloy contains 0.7% Mg, 0.5% Si, and less than 0.3% Fe.

3d-14. Fatigue Strength and Related Characteristics of Aircraft Joints. Part II. Fatigue Characteristics of Sheet and Riveted Joints of 0.040-Inch 24 S-T, 75 S-T, and R 303-T 275 Aluminum Alloys. H. W. Russell, L. R. Jackson, H. J. Grover, and W. W. Beaver. *National Advisory Committee for Aeronautics, Technical Note No.* 1485, Feb. 1948, 97 pages.

Results for direct-stress fatigue tests of sheet materials including unnotched specimens, specimens notched by drilled holes, and specimens with surface scratches; fatigue tests of riveted lap joints, riveted butt joints with various stiffeners, and multi-arc welded butt joints; tests of sheet materials and various joints at elevated temperature; and tests of cumulative fatigue damage.

3d-15. Elastic Modulus Research; Development of Alloys With High E Values. *Metal Industry,* v. 72, Feb. 20, 1948, p. 146, 152.

Reviews recent published work by Dudzinski and others in which several new and complex aluminum alloys were developed.

For additional annotations indexed in other sections, see:

2b-44; 4d-4; 9b-12; 9d-2; 11-38; 19b-27; 22b-78; 23b-13-15; 23d-35; 24b-40; 27b-17-19; 27c-7; 27d-5.

4 CONSTITUTION and STRUCTURE

4a—General

4a-12. La Contribution de la Methode de Diffraction Eletronique a l'Etude de la Couche de Beilby. (Contribution of the Electron-Diffraction Method to the Study of the Beilby Layer.) R. Courtel. *Metaux et Corrosion,* v. 22, Oct. 1947, p. 157-167.

A critical review. The Beilby layer is defined as the amorphous, or vitreous, layer formed on the surface of a metal in polishing. 60 ref.

4a-13. The Partition of Molybdenum in Hypo-Eutectoid Fe-C-Mo Alloys. *Industrial Heating,* v. 15, Feb. 1948, p. 248.

Outlines paper by F. E. Bowman. (Presented at recent regional meeting, Pittsburgh Chapter, A.S.M.)

4a-14. Single Crystals—Part II. Lineage Characteristics — Production by Surfusion. *Metal Industry,* v. 72, Feb. 6, 1948, p. 106.

Discusses recent work on the above by Hibbard, and by Lacombe and Beaujard.

4a-15. Strain Sensitivity of Magnetic Susceptibility. T. S. Hutchison and James Reekie. *Physical Review,* 2nd Series, v. 73, March 1, 1948, p. 517-518.

Studies on the magnetic properties of cold worked metals have shown that magnetic susceptibility can be considerably affected by workhardening but this effect has been regarded as a secondary one, brought about by the presence of small amounts of ferrous impurities. However, during extensive experiments with Cu and Al of the highest purity, results have been obtained which indicate that marked changes in magnetic susceptibility exist which cannot reasonably be attributed to ferromagnetic impurities.

4b—Ferrous

4b-9. Graphitization of White Cast Iron; Effect of Section Size and Annealing Temperature. Richard Schneidewind, D. J. Reese, and A. Tang. *American Foundrymen's Assoc., Preprint No.* 47-7, 1947, 7 pages.

4b-10. An Interpretation of the Constitution of Iron-Carbon-Silicon Alloys. J. E. Rehder. *American Foundrymen's Assoc., Preprint No.* 47-11, 1947, 3 pages.

Experimental data on the ternary system Fe-C-Si. 11 ref.

4b-11. Isothermal Transformation of Molybdenum Cast Iron. Charles Nagler and Ralph L. Dowdell. *American Foundrymen's Association, Preprint* No. 47-17, 1947, 16 pages.

Investigates above by metallographic methods and by a rapid magnetic method. Both methods correlate quite well. Molybdenum cast irons investigated did not have a simple typical "S" curve. They showed deep hardenability in the temperature range 900 to 1300° F.

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Foundry Equipment

Products, Materials and Services for the Foundryman, Introduced During the Past Year, as Described by the Manufacturers

SOME 260 SUPPLIERS of equipment, raw materials and services to the foundry field will further the progress toward modernization and mechanization in this important branch of the metal industry when they exhibit their products at the 1948 Foundry Show in Philadelphia next month. Held in conjunction with the 52nd annual meeting of the American Foundrymen's Association, May 3 through 7, the Foundry Show will be the first exhibit of this type since 1946.

Well-defined current trends in the foundry industry will be emphasized in the products to be displayed. These trends include growing indications of a coming buyers' market, increased mechanization in foundries, rigid control of procedures and facilities required by materials scarcities and substitutions, and emphasis on good housekeeping practices.

This article is a typical sampling of some of the new things that will be seen in Philadelphia. The products described herein, however, are not limited to exhibitors at the Foundry Show, but are those that have been introduced to the foundry industry since April 1947. Further information about these products, as well as descriptive literature, is available from the manufacturers and can be secured by using the Reader Service Coupon on page 23, circling the number corresponding to the one shown in parenthesis and black face type in the product description.

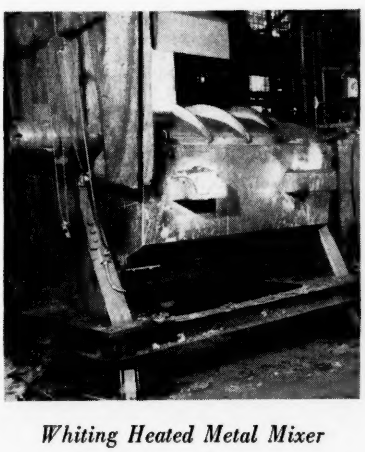
Iron and Steel Melting

Developments during the past year in ladle inoculation and more economical pouring practices are matched by new compounds and devices for adding them to the molten metal. A case in point is a new method developed by Molybdenum Corp. of America for adding boron to steel for foundry purposes **(332)**. The boron is encased in an aluminum container made to such size that it will add the proper amount of boron for each ton of steel. The quantity of aluminum absorbed by the melt is sufficient to balance the coarsening effect of the boron. The method is not only convenient by virtue of being made up in proper quantity for units of steel, but also gives efficient recovery and uniform results.

An inoculating agent for gray iron, designed principally to improve machinability by controlling the structure of the iron, is known as Nisiloy, a product of International Nickel Co. **(333)**. Its composition is essentially 60% nickel, 30% silicon and 10% iron. The alloy is prepared in a convenient particle size for cupola spout or ladle additions.

Since the nickel-silicon contents are in the eutectoid proportion, the alloy has a melting point lower than either of these constituents and lower than that of cast iron. Because of this, and because of the relatively high specific gravity of Nisiloy, it penetrates and diffuses rapidly throughout the melt, avoiding any risk of floating and oxidizing into a surface scum or slag, and exerts a strong homogenizing influence upon the product. The ferrite-forming tendency of silicon is held in check by the nickel, which serves to stabilize the austenite and form pearlite in the solid state. The result is a dense, gray, machinable structure, free from chilled areas. (Literature available.)

A simple and convenient method of degassing, deoxidizing and cleaning gray and malleable iron is provided by the use of small copper tubes containing the reactive elements. Known as Foseco IR tubes, a product of Foundry Services, Inc. **(334)** they are added to the ladle to increase fluidity, density and machinability, and to reduce chill, especially in pouring thin-sectioned castings. The number of tubes added can be varied to meet different conditions. They are produced in three sizes for various ladle capacities.



Whiting Heated Metal Mixer

An improved type of riser or feeding compound for iron and steel castings is known as Ferrux No. 99, also made by Foundry Services, Inc. **(335)**. Ferrux acts in two ways; an exothermic reaction increases the temperature of the metal and the products of the reaction form an insulating layer which prevents loss of heat by radiation and convection.

Exothermic Alloys Sales & Service, Inc., has a new exothermic graphite compound called Carb-X. **(336)**, designed for increasing the carbon when it is already near the saturation point. In addition to raising the carbon content, it will increase the fluidity of the iron, decrease the sulphur content by the action of a sodium compound incorporated in the material, and reduce the chill considerably.

A holding furnace or forehearth which eliminates the loss of temperature that usually occurs in pouring small, thin-sectioned castings has been devised by the Whiting Corp. and is known as the Whiting heated metal mixer **(337)**. It is particularly advantageous where castings are made on a production basis and molds are poured continuously on a moving conveyer. The heated metal mixer is a small, portable tilting furnace fired with pulverized coal. Holding capacity is 6000 lb.

Nonferrous Melting

Notable work on gas absorption and degassing of copper-base alloys has been sponsored by the Brass and Bronze Ingot Institute **(338)**, from whom a series of reprints describing the investigations is available.

Cuprex, a product of Foundry Services, Inc., for degassing copper and nickel-base alloys, is now available in block form **(339)**. The blocks are made by a process of briquetting without using binders that give off water or other detrimental gases. Cuprex blocks (1 to 2% of the charge

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For Bulletins and Further Information, Use Reader Service Coupon on Page 23

indicating the possibility of heat treating comparatively heavy sections. Hardenability as determined by the end-quench-type test correlated well with results determined on a 1-in. round.

4b-12. Graphite Phase in Gray Cast Iron. Robert W. Lindsay. *American Foundrymen's Assoc. Preprint* No. 47-30, 1947, 11 pages; discussion, p. 10-11.

Factors affecting the development of the above and the relationship of this structure to the properties of this group of alloys. Summary suggests the relationship of the properties of cast iron to the graphite structure. 22 ref.

4b-13. Microstructure of Silvery Pig Iron. Richard Schneidewind and Carl Harmon. *American Foundrymen's Assoc., Preprint* No. 47-31, 1947, 4 pages.

Etchants and X-ray diffraction method used.

4b-14. Segregation in Small Steel Castings. H. F. Bishop and K. E. Fritz. *American Foundrymen's Assoc., Preprint No.* 47-46, 1947, 12 pages.

As shown by experimental work.

4b-15. Self-Diffusion in Iron. C. Ernest Birchenall and Robert F. Mehl. *Journal of Applied Physics,* v. 19, Feb. 1948, p. 217-218.

Rates of self-diffusion in alpha and gamma-iron were determined by use of radioactive tracer techniques in the ranges 715 to 887° C., and 935 to 1112° C., respectively.

4b-16. Method of Phase (Carbide) Analysis of Steel. (In Russian.) S. M. Gutman. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Dec. 1947, p. 1403-1412.

New method which permits determination of the qualitative distribution of the carbon and metal between carbides and solid solutions under any annealing conditions. The method may be used in control of heat treatment of steel.

4b-17. Subzero Transformation of Austenite. R. H. Hays. *Metal Progress,* v. 53, March 1948, p. 374-375.

Two photomicrographs which won the grand prize in the 1947 A.S.M. metallographic exhibit show the metal as quenched from 2250° F. and the identical area after cooling to −110° F.

4b-18. Transformation of S.A.E. 6115 Steel During Continuous Cooling. C. A. Liedholm, A. I. Rush and W. C. Coons. *Metal Progress,* v. 53, March 1948, p. 392-B.

Diagram includes typical photomicrographs in circle form.

4b-19. Some Thermodynamical Aspects of the Formation of Inclusions in Mild Steel Weld Metal. E. C. Rollason and E. Bishop. *Journal of the Iron and Steel Institute,* v. 158, Feb. 1948, p. 161-168.

A method of thermodynamic analysis and its development and application to published analyses of nonmetallic inclusions in mild steel arc weld deposits. Inclusions analyzed at room temperature and also those calculated to exist at the freezing point are plotted on a ternary SiO_2-FeO-MnO diagram from which can be deduced the change in inclusion composition during cooling from the freezing point. A method has been evolved whereby types and amounts of inclusions in many weld metals can be determined from the FeO content of the slag and the total Mn and Si contents of the weld metal.

4b-20. Micro-Examination and Electrode Potential Measurements of Temper-Brittle Steels. D. McLean and L. Northcott. *Journal of the Iron and Steel Institute,* v. 158, Feb. 1948, p. 169-177.

Microstructure and impact strength of five alloy steels after various tempering treatments were correlated, using as etching reagents solutions of picric acid with and without surface-active compounds. In all specimens embrittled either by slow cooling or by re-tempering at intermediate temperatures, grain boundaries could be revealed much more plainly than in tough specimens of the same composition, and fracture followed the boundaries. Fractures of specimens broken at liquid-air temperature to produce intergranular fracture were examined at high power, but no difference could be detected between "tough" and "brittle" specimens to suggest an intergranular precipitate in the latter. Electrode-potential measurements on similar fractures did show differences seemingly related to grain-boundary composition.

4b-21. A Magnetic Study of Phase-Change Processes in Iron-Silicon Alloys. K. M. Guggenheimer, H. Heitler, and K. Hoselitz. *Journal of the Iron and Steel Institute,* v. 158, Feb. 1948, p. 192-199.

Measurement of variation of magnetic saturation intensity with temperature was used to investigate the above alloys. Three magnetic phases were found and their boundaries determined. A quantitative method of magnetic analysis was used to investigate various phase-change processes and their dependence on time and temperature. 13 ref.

4c—Nonferrous

4c-15. Sur l'Existence d'Une Nouvelle Modification Non-Cubique de Silicium Elementaire. (The Existence of a New Noncubic Modification of Elementary Silicon.) F. Heyd, F. Khol, and A. Kochanovsta. *Collection of Czechoslovak Chemical Communications,* v. 12, Sept.-Oct. 1947, p. 502-509.

By means of X-ray diffraction, a noncubic modification was discovered. It is unstable and may easily be transformed into the usual diamond shape by piezochemical means.

4c-16. Instantaneous Rates of Grain Growth. Paul A. Beck, M. L. Holzworth, and Hsun Hu. *Physical Review,* 2nd Series, v. 73, March 1, 1948, p. 526-527.

Previous work showed that the isothermal increase of the average grain size (D) with annealing time (t) in high purity aluminum follows the relation: $D=Kt^n$ where K and n are parameters depending on the temperature. More recent experiments show that the rate of grain growth in high-purity aluminum after 33% reduction of area by rolling depends only on instantaneous grain size and temperature, and is independent of the prior heat treatment used to produce the instantaneous grain size considered. Typical results and also data for 70-30 brass.

4c-17. Fractographic Structures in Antimony. C. A. Zapffe. *Metal Progress,* v. 53, March 1948, p. 377-381.

Third of a series of studies of fresh cleavage planes in brittle metals, where the untouched facets are examined under the high-power microscope for evidence concerning the mechanism of fracture.

4d—Light Metals

4d-3. Anomalies in the Appearance of Glide Ellipses. Robert Maddin. *Metals Technology,* v. 15, Feb. 1948, T.P. 2332, 6 pages.

Electropolishing has generally been assumed to eliminate the strain introduced by mechanical polishing and to result in a more truly representative surface, particularly in the case of soft metallic materials. However "glide ellipses" were found to occur on electropolished surfaces of 99.975% pure Al crystals. Elongation and shear on specimens mechanically polished, then electropolished, and finally strained by use of a tensile machine, were determined by X-ray diffraction. Results are described and illustrated, but no attempt is made to explain the apparent anomalies observed.

4d-4. Influence of Inclusions on Properties of Sand Cast Aluminum-Base Alloys. G. Sachs, A. W. Dana, and L. J. Ebert. *American Foundrymen's Assoc., Preprint No.* 47-26, 1947, 7 pages.

Studies six common aluminum-base alloys as to their tendency to form inclusions and also as to the manner in which their properties are affected by size and location of inclusions.

4d-5. Inclusions—A Critical Study. H. G. Warrington. *Light Metals,* v. 11, Feb. 1948, p. 96-98.

Discusses critically a recent article by M. Bardot in *Fonderie* which reviewed published information on inclusions in light alloys. (See R.M.L., v. 4, 1947, item 4-144.) Present author believes that some of the published information is misleading, especially to one not in close contact with industrial practice.

4d-6. Porosity—Another Approach. F. A. Allen. *Light Metals,* v. 11, Feb. 1948, p. 98-101.

Discusses paper by Davidlee von Ludwig, *Iron Age,* Nov. 20, 1947, (R.M.L., v. 4, 1947, item 3-392) which deals with the causes of porosity in aluminum. Also work of several others.

For additional annotations indexed in other sections, see:

3b-36; 3c-7-8-11; 7c-11; 8-42; 9b-12; 9d-2; 11-53-59-60; 14b-26; 18b-26-27; 27b-17; 27c-7.

5 POWDER METALLURGY

5a—General

5a-13. Industrial Application of the Powder Metallurgy Process. A. J. Langhammer. *Metal Progress,* v. 53, March 1948, p. 387-389.

An address delivered at Stevens Institute of Technology, on receipt of the 4th annual medal awarded by the Institute for outstanding achievement in the field of powder metallurgy.

5b—Ferrous

5b-8. Ferrum Iron With Copper. *Metal Powder News,* v. 8, Feb. 15, 1948, p. 1.

Physical properties of iron-powder sinters containing 8% Cu.

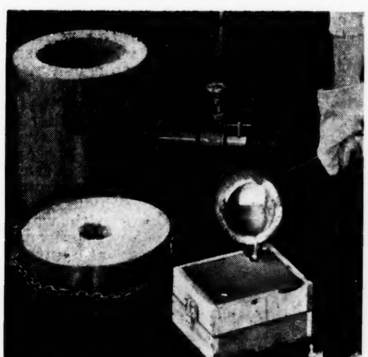
(Turn to page 14)

weight) are placed on the bottom of the empty crucible, where they remain after charging and give off scavenging gases throughout the period of melting. As the block disintegrates, it forms a protecting slag cover on the metal surface.

For degassing and grain refining of aluminum alloys, Foundry Services is producing Foseco Aluminum Degasser No. 190 in tablet form, for better control of the operation than provided by powder degassers **(340)**. The tablets are introduced into the molten metal using a plunger or tool that will hold the tablet at the bottom of the crucible until reaction stops.

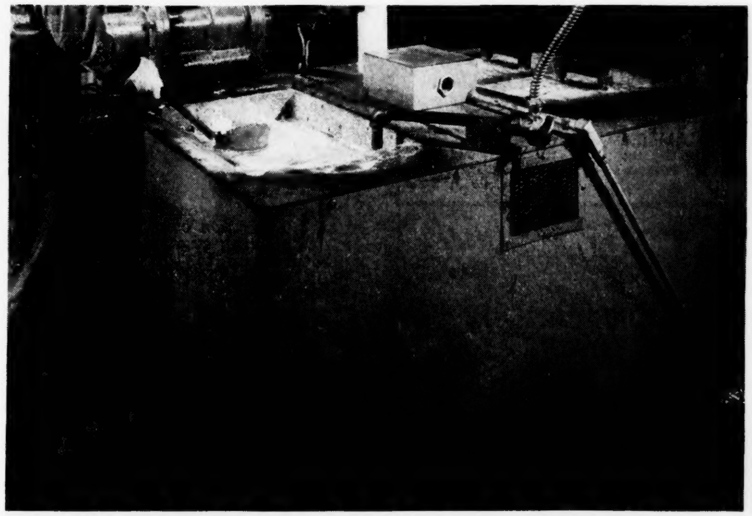
Manufacturers of induction furnaces for nonferrous melting have introduced several new ideas during the past year. Fisher Furnace Division of Lindberg Engineering Co. has devised a two-chamber unit that permits continuous pouring **(341)**. In this furnace the charging chamber is connected to the pouring chamber by a series of straight-line melting channels. Adding cold metal to the charging chamber does not affect the temperature in the pouring chamber. All residue either floats at the surface or sinks to the bottom of the charging chamber, so that only clean metal reaches the pouring chamber. The furnaces are available in capacities of 100, 300, 500 and 1000 lb. of metal per hr.

Large-size induction melting furnaces are being exploited by Ajax Engineering Corp. **(342)** through a licensing agreement with the Scomet Engineering Co. The Scomet furnaces are constructed in the form of a refractory-lined, drum-like metal holding chamber provided with a number of detachable inductor units. The inductor units can be replaced without interrupting the furnace operation. While the Scomet furnaces have been used heretofore only for the production of oxygen-free high-conductivity copper, Ajax will use the same principle for building large furnaces for copper, brass, aluminum, and zinc alloys.



Sawyer Bailey "Foundry Junior"

Ajax Engineering has also invent-



40-Kw. Lindberg-Fisher Induction Melting Furnace Used for Die Casting Aluminum at Kawin Die Casting Mfg. Co.

ed an electromagnetic pumping device for induction melting furnaces **(343)** that eliminates the need for tilting equipment or mechanical pumps to transfer molten metal from the furnace to the mold. Details are give in Mr. Lownie's article, page 5.

For laboratories and for commercial use on a small scale, A "Foundry Junior" melting furnace complete with all equipment and tools necessary to produce sand and plaster mold nonferrous castings has been announced by the Sawyer Bailey Corp. **(344)**. The complete equipment consists of furnace, crucibles, tongs, crucible holder, skimming and stirring rods, gloves and goggles, sand, flask, riddle, rammer and other tools. Capacity is 10 lb. of aluminum or 34 lb. of brass or bronze.

Continental Alloy Castings Co. **(345)** has introduced an industrial oil burner that can be lighted with a match without smoking even though the furnace is cold. One 3-in. burner will bring a 400-lb. heat of aluminum from room temperature to 1350° F. in 45 min. without endangering crucible life.

To regulate the temperature of aluminum batch melting furnaces Leeds & Northrup Co. **(346)** has recently modified its duration-adjusting type of electric control to apply to fuel-fired as well as electric furnaces. Instead of throttling the fuel valve, the D.A.T. alternately turns the fuel from full on to full off. By controlling the durations of on-time, it supplies the heat input needed to balance the heat demand of the furnace, and thus hold temperature at the desired value.

A new refractory coating for crucibles known as Vitroseal and manufactured by the Whitman Co. **(347)** forms a semiglazed protective monolithic wall that is impervious to temperatures up to 3390° F. It is shipped in powder form, and with water added is easily applied by either brush or spray.

Casting Processes

In the relatively new field of high-vacuum melting and casting of metals, National Research Corp. **(348)** has been an important pioneer, and

(*Turn to page* 15)

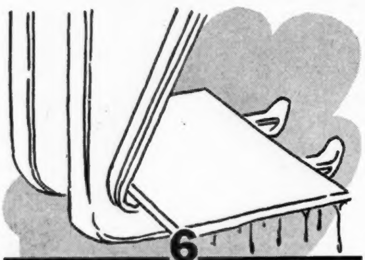
Applying Vitroseal Refractory Coating to Crucible Interior

5c—Nonferrous

5c-8. Preparation de Poudres Metalliques. (Preparation of Metallic Powders). Raymond Lautie. *Bulletin de la Société Chimique de France,* Nov.-Dec. 1947, p. 974-977.

Preparation by reaction of an alkaline metal with an appropriate compound in a 2-stage furnace. Among the metals prepared were Sb, Bi, Be, Mg, Zn, Ca, Cu, Pb, Cr, Mo, W, and U. This method is said to be superior to the calcium carbide method for metals stable up to 1000° under vacuum, when extreme purity is required.

For additional annotations indexed in other sections, see: 11-44; 27a-40.



CORROSION

6a—General

6a-17. Resistance of Materials to Fluorine and Hydrogen Fluoride. M. H. Brown. *U. S. Atomic Energy Commission,* MDDC-144, July 26, 1946, 2 pages.

Suitability of various common metals and alloys for use in contact with fluorine and HF, based on short-time tests.

6a-18. Galvanic Corrosion of Dissimilar Metals as Applied to Gas Hot Water Storage Heaters. Part I. Robert C. Weast. *American Gas Assoc.,* New York. Dec. 1947, 23 pages.

Describes test results obtained from a small-scale installation in an effort to obtain criteria for evaluating corrosion inhibitors.

6a-19. "Thermogalvanic" Effects in Corrosion. H. J. V. Tyrrell. *Metal Treatment,* v. 14, Winter 1947-48, p. 243-244, 248.

A neglected factor in electrochemical corrosion—the possible effect of temperature differences. Some recent experimental work has shown that, if two electrodes are immersed in a corrosive solution with a difference of temperature between them, attack concentrates on the cold one.

6a-20. Nitric Acid Versus Construction Materials. *Chemical Engineering,* v. 55, Feb. 1948, p. 233-234, 236, 238.

Part I of a symposium in which typical materials of construction are evaluated for services involving nitric acid. Includes the following: Iron and Steel, by A. W. Spitz; Rubber Lining, by O. S. True; Hastelloy, by C. G. Chisholm; Durimet, Chlorimet, by Walter A. Luce; Aluminum, by J. P. Balash and Ellis D. Verink, Jr.; and Precious Metals, by E. F. Rosenblatt.

6a-21. Three of the Eight Forms of Corrosion. Mars G. Fontana. *Metal Progress,* v. 53, Feb. 1948, p. 231-233.

Uniform attack, intergranular corrosion, and pitting. Not confined to ferrous metals. (To be continued.)

6a-22. Corrosion of Metals With Oxygen Depolarization. (Continued.) *Light Metals,* v. 11, Feb. 1948, p. 104-112.

Continues condensation of Russian book by N. D. Tomashoff. Concludes section on theory and describes experimental technique used in investigation of corrosion mechanisms. A graphical method for computation of the rate of corrosion processes; methods and equipment for study of the efficiency of different cathode materials. (To be continued.)

6a-23. Corrosion of Filters in Sugar Refineries. Part IV—Investigations on Flowing Liquors. H. Inglesent, E. M. Manackerman, and J. Anderson Storrow. *Industrial Chemist and Chemical Manufacturer,* v. 24, Feb. 1948, p. 76-84.

Measurements were made of the differences between electrode potentials of common constructional metals in flowing sugar liquors at temperatures up to that in operating plant.

6a-24 . How to Combat Corrosion Through Design. Part I. Causes of Corrosion. Part II. Design Measures. (Concluded.) E. T. Collinsworth, Jr. *Machine Design,* v. 20, Feb. 1948, p. 116-122; March 1948, p. 142-148.

Part I reviews the fundamental principles of the different types of corrosion. Application to design is taken up in the second installment.

6a-25. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 40, March 1948, p. 75A, 77A.

Concentration-cell corrosion. Also outlines N.A.C.E. technical program to be presented in St. Louis, April 5-8, 1948.

6a-26. Corrosion Tests in Sulphuric Acid in Petroleum Refinery Processes. W. Z. Friend. *Corrosion,* v. 4, March 1948, p. 101-111.

Results of a number of plant corrosion tests and of several laboratory corrosion tests on a variety of alloys under conditions representative of some of the sulphuric-acid applications encountered in refineries. Tests reported were made with a spool-type specimen holder.

6a-27. Corrosion Inhibitors in Theory and Practice. Robert D. Misch and Hugh J. McDonald. *Wire and Wire Products,* v. 23, March 1948, p. 221-226, 260-264.

The mechanism of inhibitor action on the basis of present knowledge. Applications of inhibitors. 36 ref.

6a-28. Galvanic Corrosion and Concentration Cell Corrosion. Mars G. Fontana. *Metal Progress,* v. 53, March 1948, p. 382-386.

Mechanism of these types of corrosion and methods for their prevention.

6a-29. A Note on the Preparation, Suspension, and Testing of Corrosion Specimens. W. Murray. *Journal of the Iron and Steel Institute,* v. 158, Feb. 1948, p. 200.

In the course of experiments on the inhibition of corrosion of metals completely immersed in water, the duplication of results was found to be impossible. Modifications in the method of preparation and suspension of specimens overcame the difficulty. The improved method covers both single-metal and bimetallic specimens and testing at 90° F.

6b—Ferrous

6b-18. Cathodic Protection of Underground Structures. N. P. Peifer. *Corrosion and Material Protection,* v. 5, Jan.-Feb. 1948, p. 6-9.

Use of a relatively new method in which expendable anodes in the form of magnesium ribbon are installed at intervals determined by a survey of earth resistivities.

6b-19. Boiler Feed Pump Corrosion?—Here's What You Can Do About It. H. L. Ross. *Power Generation,* v. 52, Feb. 1948, p. 104, 106, 108.

Causes, remedies, repair procedures, and selection of corrosion resistant materials.

6b-20. A New Concept About the Mechanism of Passivity of Iron in Nitric Acid. R. Parshad and L. C. Verman. *Journal of Chemical Physics,* v. 16, Feb. 1948, p. 154-155.

Experimental evidence which supports the theory of the formation of a hydrogen film between the metal and the oxide film. This is indicated by a sharp rise in potential on insertion of iron in nitric acid, which falls to a much lower potential after about 0.05 sec. This theory explains many phenomena associated with passivity.

6b-21. Cast-Iron Crucibles; Mechanism of Corrosion by Molten Aluminum. (Concluded.) Marcel Bardot. *Iron and Steel,* v. 21, Feb. 1948, p. 49-51. Translated from *Fonderie,* Sept. 1947, p. 798-810.

Previously abstracted from original paper. Concludes literature review. 18 ref. See item 6-323, R.M.L., v. 4, 1947.

6b-22. Corrosion Prevention by Controlled Calcium Carbonate Scale. Sheppard T. Powell, H. E. Bacon, and E. L. Knoedler. *Industrial and Engineering Chemistry,* v. 40, March 1948, p. 453-457.

Corrosion prevention in cooling-tower systems serving steel equipment discussed in an earlier paper. New data for the ionization constants of carbonic acid have been used to recalculate the pH-temperature curves, to bring them up to date. 10 ref.

6b-23. Salt as a Medium of Corrosion of Underground Cables. A. G. Andrews. *Corrosion,* v. 4, March 1948, p. 93-98; discussion, p. 98-100.

In areas where grounded d.c. electric railways are operated, some of the return current strays from the rails to underground metallic structures, such as lead-covered telephone cables, causing serious anodic corrosion problems. Protection is usually provided by low-resistance Cu conductors connecting the cables to the negative return of the railway system. This method, where several structures are drained to a common point, has a disadvantage in that various structures have different potential gradients. Typical of this is corrosion in the vicinity of rail switches treated with salt to prevent freezing. Action of stray current then causes NaOH to form around the cables, especially in ducts. Remedy applied is flushing with water when an indicator shows presence of alkali. (Presented at annual meeting of N.A.C.E., Chicago, April 7-10, 1947.)

6b-24. Control of External Corrosion on Plantation Pipe Line. Alan C. Nelson. *Corrosion,* v. 4, March 1948, p. 123-131; discussion, p. 132.

Corrosion control on the above system is divided into four major phases. First is cathodic protection of stations which have suffered num-

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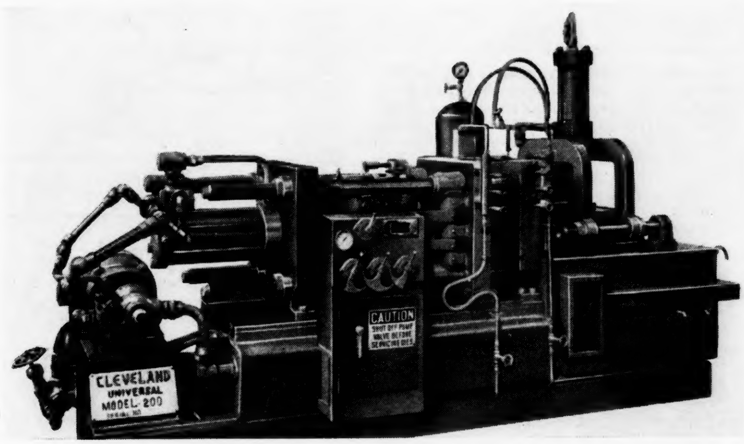
FOUNDRY EQUIPMENT



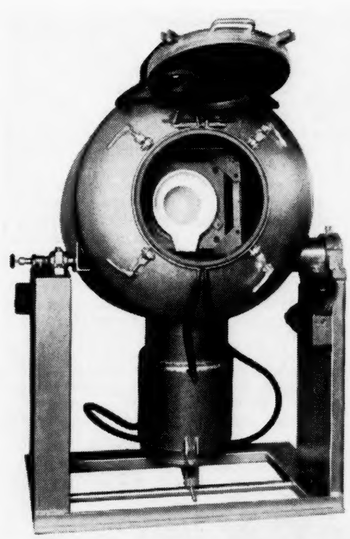
Cleveland Model 200 Die-Casting Machine

is now in a position to supply production furnaces in addition to small laboratory units. Most furnaces are individually designed to suit particular requirements, but a new brochure describes and illustrates the various components such as the shell, pumping system, valves, induction coil assemblies, molds, gages, and auxiliary components.

Ecco High Frequency Corp. **(349)** has a standard F58 vacuum melting and pouring furnace that will handle melts equivalent to between 50 and 100 lb. of steel. The furnace consists of a welded, vacuumtight, nonmagnetic steel shell within which is mounted a crucible surrounded by a water-cooled coil through which high frequency current is passed. The shell is tilted on hollow pivots, one with the vacuum pump connection, and the other, on the opposite side, connected to a vacuum break valve. Gaskets are used under the top cover and under the mold chamber cover. Water jackets keep the gaskets and the mold chamber cool.

Precision castings of high speed, tool, stainless, alloy, machining and special-purpose steels are being produced by Crucible Steel Co. of America under the trade name Accumet **(350)**. A new booklet describes and illustrates various parts and products made from these alloys to close tolerances and good finish.

A new permanent mold process for small and large runs of aluminum castings has been perfected by Valley Casting Corp. **(351)**. It is particularly adapted for runs of 2500 to 5000 finely finished parts produced in a short time; only 48 hr. is required to turn out molds from patterns of ordinary complexity.



Ecco Vacuum Melting Furnace

Die Casting

Furthering the technique of producing solid, dense die castings, Kux Machine Co. has introduced the Kux injection pressure multiplier **(352)**. The device multiplies the injection pressure during the final travel of the plunger's stroke, so that the ending pressure may be two to five times the starting pressure. The pressure multiplier is built into the hydraulic injection cylinder, and requires no additional space nor maintenance.

Kux has also introduced the new Model BA-12 **(353)**, with speeds as fast as 700 die-casting cycles per hr. It is an air-operated machine with automatic timing and pushbutton control of the complete die-casting cycle. It will cast parts up to 5 lb. in zinc.

Several improvements have been incorporated in Cleveland Automatic Machine Co.'s Model 400 hydraulic die-casting machine **(354)**. All pipe lines have been changed to leakproof high-pressure steel tubing, automatic electric timing has been made standard, and electric heating equipment has been added. A simple, easily accessible hand crank adjustment has been provided for changing the stroke of the movable platen (thus decreasing cycle time), and a control valve stops the platen in any position forward or reverse. The Model 400 is a universal machine in which the hot-metal end can easily be converted to cold chamber. (Literature available.)

A new Cleveland Model 200 has also been introduced, smaller than the 400 (27 x 27-in. platens), for high production of small or medium size castings **(355)**. Many parts are interchangeable with those of the Model 400—for instance, platen and die plate, T-slots, goosenecks, nozzles, plungers and sleeves.

The Wickes No. 4 is a hydraulic die-casting machine which is entirely automatic in operation and timing, or can be operated manually if desired. Wickes Brothers **(356)**. It is of large capacity (up to 25 lb. of zinc per shot), and gives high-velocity

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Wickes No. 4 Will Cast up to 25 Lb. of Zinc per Shot

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erous leaks in small control lines. Second is cathodic protection of tank bottoms. Third is cathodic protection of the main line with its numerous spots of coating. Fourth, is drainage of strong, fluctuating stray current at a number of electric-railway crossings. (Presented at annual meeting of N.A.C.E., Chicago, April 7-10, 1947.)

6b-25. The Corrosion of Heating Surfaces in Boiler Plants: Further Studies in Deposit Formation. J. R. Rylands and J. R. Jenkinson, *Engineer,* v. 185, Feb. 27, 1948, p. 215-216; discussion, p. 212-213. A condensation.

Relative corrosion of cast iron and steel in air heaters and heat exchangers. Effects of design on corrosion resistance and the cleaning of air heaters and heat exchangers by washing. (Presented at joint meeting of Institutions of Mechanical and Electrical Engineers, London, Feb. 20, 1948.)

6c—Nonferrous

6c-3. Die Oxydationsgeschwindigkeit von Nickel bei Kleinen Zusätzen von Chrom und Mangan. Beitrag zur Theorie des Anlaufvorganges. (The Rate of Oxidation of Nickel With Low Chromium and Manganese Additions. Contribution to the Theory of the Tarnishing Process.) Carl Wagner and Karl-Erik Zimens. *Acta Chemica Scandinavica,* v. 1, 1947, p. 547-565.

Experimental data and a theoretical development. The rate of oxidation of nickel is markedly increased by small additions of Cr or Mn. Mixed oxide phases containing increased bivalent-nickel concentrations are formed. The forces causing migration in such phases are analyzed. In Ni-Cr alloys with high Cr content, the rate of oxidation decreases considerably. By analogy with other systems, it is assumed that a new phase with low ion motion is formed. 31 ref.

6c-4. Sur l'Attaque de Plomb par le Gaz Sulfureux. (Corrosion of Lead by Sulphur Dioxide). Andre Chretien and Jean Broglin. *Comptes Rendus* (France), v. 225, Dec. 22, 1947, p. 1315-1317.

Using same apparatus as previously described for study of corrosion of other metals by various gases, the effect of SO_2 on lead was investigated. During the reaction, the temperature dropped from 725 to 690° and the pressure rose from 137 to 760 mm. Hg. Two phenomena occur successively: the gas is fixed by formation of the dibasic sulphide and sulphate, then it is liberated by reversal of the reaction.

6c-5. The Action of Natural Waters on Lead. G. Miles. *Journal of the Society of Chemical Industry,* v. 67, Jan. 1948, p. 10-13.

Analyses of a series of natural waters are given, together with results of a standard test for initial action on lead. Correlation between calcium carbonate saturation index, organic content, and the degree of initial action on lead of these waters is attempted.

6c-6. Effect of Inhibitors on the Corrosion of Zinc in Dry-Cell Electrolytes. Clarence K. Morehouse, Walter J. Hamer, and George W. Vinal. *Journal of Research of the National Bureau of Standards,* v. 40, Feb. 1948, p. 151-161.

A study of substitutes for mercury and chromate films in curtailing corrosion of the zinc anode of Leclanche dry cells at high temperatures. Certain organic compounds and certain commercial products were found to be effective. However dry cells made with them did not have the expected increase in shelf-life or electrical output. On the other hand, the paste wall of the dry cell was found to have inhibiting properties. Two active constituents were isolated, and found to be effective in retarding the corrosion. These materials will increase the capacity of dry cells at moderate temperatures.

6c-7. Oxide Films Formed on Titanium, Zirconium, and Their Alloys With Nickel, Copper, and Cobalt; an Electron Diffraction Study. J. W. Hickman and E. A. Gulbransen. *Analytical Chemistry,* v. 20, Feb. 17, 1948, p. 158-165.

Structures found are plotted on existence diagrams as functions of time and temperature. Attempts are made to correlate the structures obtained with thermodynamic data reported by other workers. 21 ref.

6d—Light Metals

6d-3. Corrosion Cracking of Magnesium Alloys. (In Russian). E. M. Zaretskii. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 20, Sept. 1947, p. 823-829.

The corrosion resistance of 1-mm. sheet containing 5.62 to 5.84% Al; 0.95% Zn; 0.38% Mn; 0.09% Si, and 0.05% Mg was investigated under conditions of tensile stress and at temperatures from room to 420° in air and in various other media. Attempts to improve stress-corrosion resistance by cold working or heat treatment were unsuccessful.

6d-4. Corrosion Cracking of Cast Magnesium Alloys. (In Russian). E. M. Zaretskii. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 20, Sept. 1947, p. 830-840.

Stress-corrosion resistances of cast manganese, of the alloy mentioned in the preceding abstract, and of another one containing 10% Al, 0.20%Mn, 0.04% Fe, and 0.99% Si, were investigated. The first was not sensitive to stress-corrosion; the cast form of the second, contrary to the cold worked form, is also not sensitive; the latter cast alloy has a slight tendency toward stress-corrosion, which can be eliminated by proper heat treatment and quenching procedure. The mechanism of stress corrosion in cold worked and cast magnesium alloys. 12 ref.

6d-5. Corrosion Characteristics of Some Magnesium-Zinc-Calcium Alloys. G. C. Kuczynski and F. Schonfeld. *Journal of Electrochemical Society,* v. 93, Feb. 1948, p. 41-46.

The resistances to corrosion of 45 cast Mg-Zn and Mg-Zn-Ca alloys were investigated by 14-day exposure to an alternate immersion test. The corrosion rate increased with increasing Zn content in the range from 0 to 5.5% Zn. The rate was sharply reduced by addition of 0.10 to 0.55% Ca. 10 ref. (To be presented at Columbus, Ohio, meeting of the society, April 14-17, 1948).

6d-6. The Mechanism of the Corrosion of Aluminum. J. M. Bryan. *Chemistry & Industry,* Feb. 28, 1948, p. 135-136.

Properties of the oxide film are discussed in relation to the known facts concerning aluminum and the electrochemical theory of corrosion. A modification of the usual electrochemical explanation is suggested to account for the behavior of aluminum in alkaline solution. 13 ref.

For additional annotations indexed in other sections, see:

3a-28; 3d-10-13; 7a-52; 11-41; 15c-2; 24b-41; 27a-31-37-42.

7 CLEANING and FINISHING

7a—General

7a-47. Elastic Properties of Paint Films for Metals. S. Conolly. *Metal Treatment,* v. 14, Winter 1947-48, p. 222-226.

Results of experimental work on the elastic properties of paint films detached from specially prepared metal surfaces. Effects of modification of the drying oils, pigmentation, and incorporation of resin.

7a-48. Clear Coatings With Rust Preventive Properties. Helen Sellei and Eugene Lieber. *Corrosion and Material Protection,* v. 5, Jan.-Feb. 1948, p. 10-12, 22.

Background and initial development of transparent and readily removable coatings for use in packaging and storage of metallic parts and equipment.

7a-49. Surface Treatment for Metal Before Painting. Arthur P. Schulze. *Industrial Finishing,* v. 24, Feb. 1948, p. 48, 52, 54, 56, 61-62, 64, 66.

The various methods.

7a-50. Coated Abrasives. *Materials & Methods,* v. 27, Feb. 1948, p. 105, 107.

Tabulates properties and applications.

7a-51. Interior Coating of Tubular Containers. L. P. Hubbuch and W. C. Johnson. *Industrial and Engineering Chemistry,* v. 40, Feb. 1948, p. 297-301.

The coating of the interiors of containers for certain poison gases was studied. Coatings based on straight 100% phenol formaldehyde resins were found resistant enough to prevent the decomposition of the gases which occurs when they are stored in contact with iron or steel. A modified dip method was worked out to provide uniform, thin, continuous coatings.

7a-52. Protective Coatings. R. M. Burns. *Metal Progress,* v. 53, Feb. 1948, p. 276, 278-279.

Summarizes two talks by the author given at Western Metal Congress, Oakland, Calif. March 1947. Fundamentals of corrosion and use of both metallic and non-metallic coatings for metals.

7a-53. Electroless Plating on Metals by Chemical Reduction. *Electroplating,* v. 1, Feb. 1948, p. 149-150. Reprinted from *Products Finishing,* Sept. 1947.

Previously abstracted from above source. See item 7-364, R.M.L., v 4, 1947.

7a-54. Brushing Machine Cuts Cleaning Operations. *Automotive Industries,* v. 98, Feb. 15, 1948, p. 45.

50% reduction in production costs is claimed for use of a new semiautomatic power brushing machine for removing oil, grease and dirt from automobile and truck clutch plates just prior to final inspection.

7a-55. Preparing Surfaces for Metalizing. Rick Mansell. *Steel,* v. 122, March 1, 1948, p. 93-95, 119, 122, 125.

Use of blasting, rough-threading,

(Turn to page 18)

metal injection; the plunger is actuated by two snap-action hydraulic cylinders energized from a powerful high-pressure accumulator mounted in the base of the machine. (Literature available.)

Extremely fast are two new die-casting machines of smaller capacity than the standard machines in Hydraulic Press Mfg. Co.'s line **(357)**. Model 150-A is for cold-chamber casting of aluminum, magnesium and copper alloys, making parts up to 4.1 lb. in aluminum. Model 150-Z uses the submerged injection system for casting zinc, lead and tin alloys (up to 8 lb. in zinc). Both machines have a 150-ton all-hydraulic die clamping system. (Literature available.)

Reed-Prentice Corp.'s No. 2 die caster **(358)** is a hydraulic machine for lead, tin or zinc-base alloys, with 38 x 36-in. die plates and space between bars 24 x 24 in. The furnace is cylindrical, with a new gooseneck design, allowing easy removal of the gooseneck and nozzle. The round pot also lasts longer because of tangential firing and elimination of stress points at corners. This Model 2 is also available with horizontal plunger and cold-chamber attachment for aluminum, magnesium or brass.

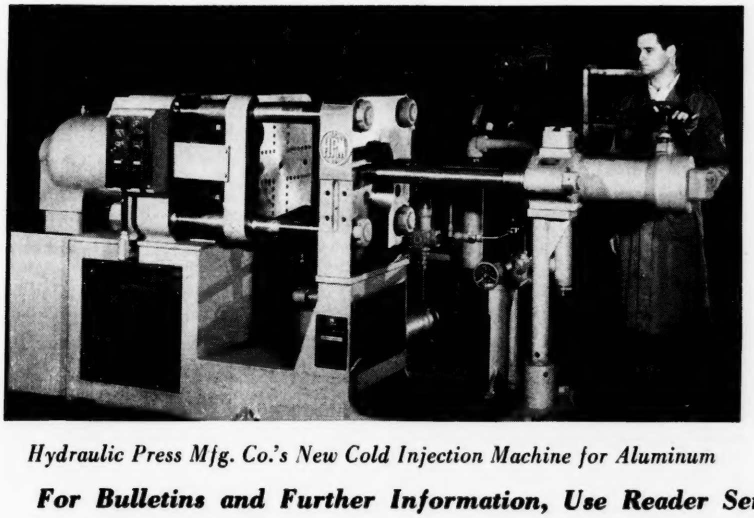
A new size and style of hydraulic machine, designated Model HD-302 by H. L. Harvill Mfg. Co. **(359)**, is a heavy-duty type, convertible from normal cold-chamber operation to optional hot chamber by installation of a special self-contained unit. Injection pressure is controlled by the piston size and ranges from 3400 psi. with a 3¼-in. diameter piston to 11,800 psi. using 1¾-in. piston. The conversion unit consists of a holding furnace beneath the injection cylinder, a blower and temperature control unit, a metal pump assembly with motor, and a hot-chamber injection assembly. The latter is not immersed in the molten metal, and is therefore not subject to the deterioration encountered with the ordinary gooseneck assemblies.

A small, low-cost hot-chamber die caster has also been added to the Harvill line, known as Model AHH-1 **(360)**. The injection piston is air operated, and dies are opened and closed manually. Operating speed up to 500 cycles per hr. is possible, depending on the operator and nature of the castings.

The Two-Pounder **(361)**, a pneumatically operated machine for both zinc and aluminum, is controlled entirely from one toggle switch, and has a production rate of 350 shots per hr. Die blocks are 12 x 18 in., with no tie bars to interfere with core pulls or placement of inserts. It is announced by D.C.M.T. Sales Corp., along with a 3-oz. cold-chamber machine for aluminum alloys **(362)**, which is also very fast in operation, compact, and low in cost. It uses inexpensive single-cavity molds and a separate melting furnace. (Literature available.)

Gerity-Michigan Corp. **(363)** announces that it is producing the longest die casting ever made. It is a zinc automobile fender molding strip, 5½ ft. long and weighing 2¾ lb. The die for producing the casting weighs 10,000 lb. and is 80 in. long. Made of special alloy steel to resist pressure and heat, it is expected to give many years of service.

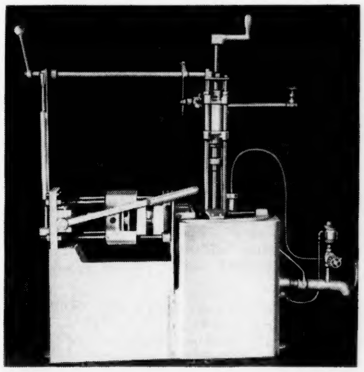
A new lubricating compound developed principally for lubricating the piston on cold-chamber die-casting machines is known as Die Slick No. 4 **(364)**. It resists heats, prevents scoring and sticking, and contains no fats or heavy carbonizing materials to cause gumming. It is highly viscous and is generally applied with brush or swab, although it can be sprayed where conditons make it necessary. G. W. Smith & Sons, Inc. (Literature available.)



Hydraulic Press Mfg. Co.'s New Cold Injection Machine for Aluminum

Flasks and Patterns

Cast aluminum quick-release flasks and jackets are known as the "Stripper" line, produced by General Foundry Service Corp. **(365)**. They are provided with cam corner locks to release the flask instantly without rapping. A specially designed pattern on the inner surfaces holds the sand firmly in place; no sand strips are used. Cope and drag sections are aligned with chromium-plated steel pins, and cold rolled steel wear strips protect strike-off edges.



Harvill Small Hot-Chamber Die Caster, Model AHH-1

Magnesium bottom boards combine the advantages of light weight with durability, according to Edward S. Christiansen Co. **(366)**. They also resist heat and withstand normal run-outs and spills of molten metal. They will not warp or break, split or splinter, and have no nails to come loose. They can be used as a combination squeezer and bottom board, and a vented design permits gases to escape, and the sand to retain its permeability. (Photo on page 19.)

Plastic patterns, identified as Plastiplates, are available from Plastic Corp. of Chicago **(367)**. To the advantages of light weight and moderate cost are added long wear, smooth surface and good strength. Being a nonconductor of heat, the plastic does not promote condensation. The plastic can be drilled and machined, and if chipped can be readily repaired with a patching material. (Literature available.)

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or electric bonding methods to clean and roughen surfaces before metal spraying.

7a-56. The Sodium Hydride Process and New Method of Descaling Metals; Application to Wire and Strip. N. L. Evans. *Wire Industry,* v. 15, Feb. 1948, p. 105-107.

The process and equipment necessary, the method of constructing it, and the manner of its operation for wire and metals in other forms.

7a-57. Health Hazards of Metal Cleaning Compounds. Part III. P. M. Van Arsdell. *Organic Finishing,* v. 9, Feb. 1948, p. 18-28, 32.

Halogenated hydrocarbons; methylene dichloride; chloroform; carbon tetrachloride; dichlorethylene; trichlorethylene; tetrachlorethylene; and miscellaneous solvents. 75 ref.

7a-58. Protection for Polished Metal Sheets. *Plastics* (London), v. 12, Feb. 1948, p. 59.

Describes "Birlon", a strippable plastic-film coating developed in Britain.

7a-59. Developments in Shotblasting. R. Ankers. *Foundry Trade Journal,* v. 84, Feb. 12, 1948, p. 151-154.

Mechanical impact blasting, shot peening, and liquid honing.

7a-60. The Vapor Blast Liquid Honing Process. R. Ankers. *Machinery* (London), v. 72, Feb. 12, 1948, p. 214.

(Condensed from paper presented to Manchester Association of Engineers.)

7a-61. Cleaning Surfaces by Nonerosive Blasting. Joseph Albin. *Metal Finishing,* v. 46, March 1948, p. 54-56, 61.

This method of cleaning, also known as seed or soft-grit blasting, promises interesting applications in the metal-finishing field. Describes its use in airlines maintenance for cleaning engine parts without causing abrasion of critical surfaces. Details of production methods, economy, and flexibility of the process.

7a-62. Finishing Metals by "Liquid Honing". Charles H. Wick. *Machinery,* v. 54, March 1948, p. 158-161.

Use of abrasive suspended in a water-chemical solution and discharged from a nozzle by compressed air. Some remarkable increases in the life of cutting tools, molds, and dies have been obtained in this way.

7a-63. Selection of Protective Coatings for Metals. K. G. Compton. *Corrosion,* v. 4, March 1948, p. 112-122.

The various types, including metallic, organic, inorganic, and temporary, and their subdivisions. Descriptions of various test methods. (Presented at Symposium on Modern Metal Protection, Cleveland, Sept. 1, 1947.)

7a-64. Vertical Conveying System Saves Floor Space in Paint Baking Operations. *Steel,* v. 122, March 15, 1948, p. 111.

7a-65. Metal Cleaning Processes—I. Factors Determining Methods and Materials. L. Sanderson. *Chemical Age,* v. 58, Feb. 7, 1948, p. 205-206, 208.

(To be continued.)

7b—Ferrous—Base Metals

7b-31. The Deposition of Pure Boron. Part III. A Flow Method for the Preparation of Boron Films on Iron Cylinders. H. I. Schlesinger, George W. Schaeffer, Glen D. Barbaras, and John D. Farr. *U. S. Atomic Energy Commission,* MDDC-1340, Nov. 14, 1944, 10 pages.

Method and apparatus. Experimental data on effect of partial pressure of diborane and hydrogen, temperature of deposition, nature of the surface, and rate of flow on nature of the deposit.

7b-32. Report on the Evaluation of Surface Treatment of Steel Prior to Painting. Arnold J. Eickhoff. *ASTM Bulletin,* Jan. 1948, p. 77-80.

Final report of outdoor-exposure tests conducted by Subcommittee XXIX of A.S.T.M. Committee D-1 on Paint, Varnish, Lacquer, and Related Products to determine the effect of cold phosphate-phosphoric acid pretreatments of steel surfaces which were subsequently painted.

7b-33. Low Temperature Phosphate Coating for Steel Easily Applied. Norman P. Gentieu. *Materials & Methods,* v. 27, Feb. 1948, p. 74-75.

Reduction of the cost of rustproofing steel by use of a process which can be operated at low bath temperatures. This is a cold spray process known as Granodizing. Surface structures of treated and untreated sheet.

7b-34. How Much Zinc Does Pole-Line Hardware Carry? B. J. Barmack. *Electric Light and Power,* v. 26, Feb. 1948, p. 68-73.

Specifications for zinc-coating and data on the effects of different methods of preliminary surface treatment and application on coating thickness and weight per sq. ft. Results of stripping tests. Suggestions are offered toward the solution of the problem of longer-life hardware.

7b-35. Surface Preparation, Painting and Paint Baking Setup for Screen and Storm Sash. Walter Rudolph. *Industrial Finishing,* v. 24, Feb. 1948, p. 68-69, 72, 74-75.

Procedures and equipment used for steel sash.

7b-36. Aluminum Clad Strip. *Iron and Steel,* v. 21, Feb. 1948, p. 48. Based on B.I.O.S. Report No. 3617, by H. Miller and P. Hahn.

Manufacture of "Feran" steel in Germany.

7b-37. Finishing Galvanized Iron Surfaces. Ivor Richards. *Organic Finishing,* v. 9, Feb. 1948, p. 33, 36-40.

The problem of preparing the surface of galvanized-iron sheets for painting has not yet been completely solved; however, much progress has been achieved in recent years.

7b-38. Conveyer Chain Descaling. *Organic Finishing,* v. 9, Feb. 1948, p. 44-45.

Unique power-brushing technique being used in refrigerator plant.

7b-39. Handling Titanium Acid Resisting Enamels. N. H. Stolte. *Enamelist,* v. 25, Feb. 1948, p. 19-20, 47.

Recommended procedures.

7b-40. "Porcelain Wallpaper" Dramatizes the Versatility and Flexibility of "Porcelain on Steel". Dana Chase. *Finish,* v. 5, March 1948, p. 33-36.

The ceramic coating of steel in continuous sheets—from raw-steel coil to finished 100-ft. lengths.

7b-41. Novel Fixture Increases Output. *Production Engineering & Management,* v. 21, March 1948, p. 60.

"Merry-go-round" fixture for automatic-cyaniding of automobile parts at Studebaker.

7b-42. Fabricating and Finishing Stainless Steel. Part III. Arthur P. Schulze. *Metal Finishing,* v. 46, March 1948, p. 62-67, 75.

Grinding, polishing, and buffing. Cycles to follow in mechanical surface finishing of stainless. 10 ref.

7b-43. Cementiferous Paints. J. E. O. Mayne and R. S. Thornhill. *Journal of the Iron and Steel Institute,* v. 158, Feb. 1948, p. 219-228.

The mechanism of setting and the protection furnished to steel by cementiferous paints. These paints are based on mixtures of zinc dust and certain chloride solutions which produce a matrix of oxychloride cement by action on the zinc; sufficient metallic zinc is left to provide cathodic protection to steel exposed by pores. Of the chlorides tested, those of Ba and Sr produce setting at high and low humidities; Mg and Ca chlorides are satisfactory except at very high humidities. The oxychloride matrix is unstable in the presence of water, and cementiferous paints slowly disintegrate when immersed in seawater. Best results will be obtained if the cementiferous paint is covered with an organic sealing coat. 12 ref.

7b-44. Marine Exposures of Cementiferous Painting Schemes. K. A. Pyefinch. *Journal of the Iron and Steel Institute,* v. 158, Feb. 1948, p. 229-235.

Tests on painted steel specimens which were subjected to total and partial immersion in the sea for periods of up to 2 years. Three types of compositions were investigated. Types in which a cementiferous primer was covered by an oleoresinous antifouling coat gave excellent results; they were particularly promising for use at the waterline, where conventional combinations give unsatisfactory results.

7b-45. Progress in the Development of "Low-Temperature" Porcelain Enamels; A Development Report on 1300° F. Molybdenum Enamels. Karl Kautz. *Finish,* v. 5, Feb. 1948, p. 25-26, 66.

Previously abstracted from *Better Enameling,* v. 19, Jan. 1948, See Item 7b-19.

7c—Nonferrous—Base Metals

7c-10. How to Finish Copper and Copper Alloys. R. W. Belfit, Wm. E. Baulieu, E. W. Lovering, and B. H. McGar. *American Machinist,* v. 92, Feb. 26, 1948, p. 95-106.

Methods and practices used in industry for deburring, polishing, buffing, cleaning, pickling, surface preservation, and decoration. Metals to which the information applies are copper, brasses, special brasses, aluminum bronzes, silicon bronzes, phosphor bronzes, manganese bronzes, nickel silvers, and Cu-Ni alloys.

7c-11. Small-Angle X-Ray Scattering From Metal Deposits Made by Evaporation. Benjamin Carroll. *Journal of Chemical Physics,* v. 16, Feb. 1948, p. 153-154.

Aluminum and copper deposits produced at 10^{-2} and 10^{-4} mm. by means of Debye-Scherrer and small-angle diagrams were examined. It was found that the black deposits exhibited marked small-angle scattering of X-rays and bright deposits did not; however, the Debye-Scherrer diagrams were substantially alike regardless of wide variations in reflectivity of the metal surface toward white light.

7d—Lightweight—Base Metals

7d-7. Chemical Surface Treatment for Aluminum Alloy Die Casting. *Machinery* (London), v. 72, Jan. 29, 1948, p. 155-156.

Recommended procedures.

7d-8. Dyeing of Anodized Aluminum. S. Howard Withey. *Electroplating,* v. 1, Feb. 1948, p. 143.

Recommended procedures for the anodizing as well as the dyeing.

7d-9. Priming Aluminum. *Metal Industry,* v. 72, Feb. 20, 1948, p. 145.

Selection of the proper primer for use prior to painting.

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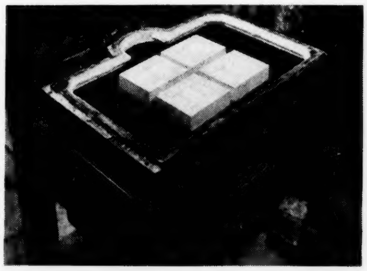
FOUNDRY EQUIPMENT

A Herman Stone Co. granite block finds a new use as a level base for casting plaster molds (**368**), and a new lacquer for wooden patterns developed by the Glidden Co. (**369**) is said to provide a very smooth surface and to resist water, oil, kerosene, heat and abrasion.



Plaster Molds Cast on Granite Block

A sprue-making device known as the Shur-Spot sprue can be used with existing gated or plated patterns. A ¼-in. hole is drilled in the pattern gate or runner at the spot where the pouring sprue is usually cut. A pin on one end of the device is inserted into this hole before sand is added to the cope. The sprue-making device squeezes down with the sand when the cope is squeezed in the regular way. When the squeezer board is removed, the Shur-Spot pops up and may be lifted out. Federal Foundry Supply Co. (**370**).

Molding and Coremaking

Tabor Mfg. Co.'s jar, power rollover, power draw, molding machine has a plate so designed that all four clamps can be set independently (**371**). Individual adjustment compensates for irregularities in coreboxes or pattern boards and flasks, and the machine is particularly useful where pattern changes are frequent. The new changeover table for independent clamping also can be installed on some older machines.

A jolt, clamp, rollover draw molding machine, designated as the 9000 series and made by SPO, Inc. (**372**), features large trunnions with heavy anvil frame to take the jolt punishment, valveless jolt blow control ranging from a light tap to a heavy blow, and adjustable two-speed draw control. Based upon 80-lb. line pressure, capacities range from 600-lb. jolt and 2500-lb. squeeze to 1000-lb. jolt and 14,5000-lb. squeeze.

At least three new core blowers have been introduced during the year. Randall Corp. (**373**) uses a swing-type head to blow multiple cores without refilling; many extra motions, as well as the cost of extra cartridges, are eliminated. The head has a 360° turning radius and is adaptable to coreboxes of all shapes. Blow head capacity is 13 lb.

Interstate Pattern & Machine Co. (**374**) has a fully automatic machine designed for horizontally split boxes. Effective clamping area is 35 sq. in., and blow plates 2½ x 10 in., 10 x 10 and 10 x 12 are interchangeable.

Wm. Demmler & Bros. (**375**) has a new core blower similar in design but larger than the unit described in *Metals Review* for April 1947. It will accommodate boxes 9 in. long and handle cores weighing up to 3 lb. Sand magazine opening is 4½ x 9½ in. A single hand valve opreates both vertical and horizontal corebox clamps and blows the core; only 3 sec. is required for a full cycle.

An air separator for core blowing machines and other pneumatic machinery in the foundry has been announced by Chicago Mfg. & Distributing Co. (**376**). It has no moving parts, screens or filters, and is entirely mechanical in operation. Maximum rated capacity is 250 cu. ft. per min. The separator is 8 in. in diameter and 15 in. high.

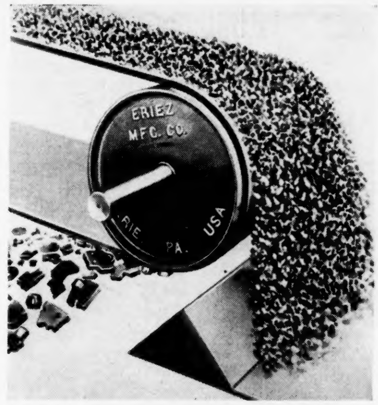
An all-purpose oven with a range of 100 to 750° F., made by Morrison Engineering Corp. (**377**), is specially suited for core baking and mold drying. It is constructed of interlocking panels packed with fiberglas insulating blankets. Full forced convection permits close automatic temperature control. Fuel may be oil, gas, steam or electricity.

Harbison-Walker Refractories Co. (**378**) is marketing ready-made breaker core shapes of refractory material, designed to replace the baked sand cores in common use. They are furnished in sizes recommended by the Technical Research Committee of the Steel Founders' Society of America.

Sand Handling and Treatment

A new sand screening and conditioning unit is designed low enough so that it can be fed by a power floor dump shovel. The machine is on wheels and can be moved around the shop by the same shovel loader that feeds it. Simplicity Engineering Co. (**379**)

Magnesium Bottom Board



Eriez Magnetic Pulley Separator

Three companies have announced magnetic pulley-type separators, designed for automatic separation of any magnetic material from non-magnetic, and ideally useful for foundry sand reclamation. Material to be separated is fed into a hopper at one end and passes onto a conveyer belt which carries it over the magnetic head pulley. Magnetic material is attracted to the pulley and carried around to the underside of the cylinder, where it is discharged. In the unit made by Magnetic Engineering & Mfg. Co. (**380**), nonmagnetic material falls off the pulley into a revolving screen, where it is sized as required. In the permanent magnet device made by Dings Magnetic Separator Co. (**381**) the pulley has a crown face to prevent belt weaving and to aid in even distribution of the burden across the belt as it passes over the pulley. The Eriez Mfg. Co. pulley (**382**) is powered by a giant Alnico magnet, and can be used in locations where electric power is impractical because of severe temperature changes or unusual operating conditions.

A vertical furnace for flash drying sand and other granular materials has been adapted from the multiple hearth type of furnace by Nichols Engineering & Research Corp. (**383**). The height of the kiln and the number of hearths are a function of the tonnage of sand and the amount of water to be evaporated. It has no moving parts, and is available with direct-fired gas or oil burners.

A new core oil developed by Alox Corp. (**384**) consists of a mixture of oxygenated hydrocarbons derived from petroleum. Strongly bonded sand cores are made by blending 1 part oil to 40 parts core sand and

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7d-10. Polishing and Buffing Aluminum. C. J. Hinton. *Plating,* v. 35, March 1948, p. 248-250.

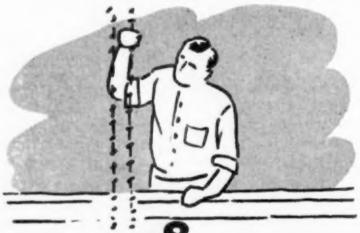
Differences between polishing and buffing Al and other metals. Buffing of soft Al surfaces.

7d-11. Power Brushing of Light Weight Metals. *Production Engineering & Management,* v. 21, March 1948, p. 71.

Trend toward increased use of power brushing as a light-metals parts-finishing operation.

For additional annotations indexed in other sections, see:

8-48; **14a**-28; **16b**-21-28; **20a**-87; **21b**-14; **22a**-58; **23b**-18-19; **24b**-41.



8

ELECTRODEPOSITION and ELECTROFINISHING

8-36. Mechanism of Electrodeposition of Nickel. Part I. Ultramicroscopic Investigation of the Process. Part II. Role of Hydrogen in the Process of Electrodeposition of Metal. (In Russian.) G. S. Vozdvizhenskii. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 20, Sept. 1947, p. 813-822.

In Part I, it is shown that, contrary to the assumptions of other investigators, no colloidal solutions or suspensions of basic compounds are formed in the region near the cathode. The mechanism of formation of basic Ni compounds on the cathode is explained. In Part II, the effect of hydrogen on structure and properties of the deposits was investigated. 26 ref.

8-37. Danger of "Masked Pores" and Methods for Their Determination. A. Glazunov. *Journal of the Electrodepositors' Technical Society,* v. 23, 1948, p. 9-13. (Reprint).

In certain cases, pores in electrodeposits are "bridged" by forming "masked pores", which are hard to detect, but which represent points at which failure will soon occur. An electrographic method of detection in which the specimen is made the anode, an aluminum plate the cathode, and a sheet of filler paper or cellophane moistened with a suitable reagent inserted between them. Appearance of colored spots after a delay of half a minute indicates the presence of masked pores.

8-38. Presidential Address; The Relation of Electrodeposition to Electrochemistry. G. E. Gardam. *Journal of the Electrodepositors' Technical Society,* v. 23, 1948, p. 1-4; discussion, p. 5-8. (Reprint).

Knowledge of theoretical electrochemistry has been much less helpful in the improvement of electrodeposition methods than would be expected. Reasons for this fact and ways in which more correlation may possibly be achieved in the future.

8-39. Electrodeposition of Lead From the Ethylbenzenesulfonate Bath. Frank C. Mathers and John F. Suttle. *Journal of the Electrochemical Society,* v. 93, Feb. 1948, p. 47-48.

A cheaper or more satisfactory lead plating and refining bath than the usual ones with fluoborate or fluosilicate would be desirable. Many different addition agents were tried, but none gave as good deposits as could be obtained from corresponding lead fluosilicate baths. The best results were with β-naphthol and glue, or goulac, or both.

8-40. Domestic Appliances; Choosing the Finish for the Job. A. Gellman. *Electroplating,* v. 1, Feb. 1948, p. 137-142.

The three main requirements: appearance, protective capacity, and durability. Recommended procedures for performance testing and for interpretation of results.

8-41. Lead Plating of Aluminum Bronze. *Electroplating,* v. 1, Feb. 1948, p. 151-152; discussion, p. 152. Condensed from paper by H. Silman.

Technique developed for a bronze bearing metal containing 10 to 12% Al. (Presented at meeting of Electrodepositors' Technical Society, London, Dec. 15, 1947.)

8-42. The Metallography of Electrodeposited Surfaces (Continued.) **The Physics of Grinding and Polishing. Part II—Changes in Metal Surface Character During Machining, Grinding and Polishing.** A. T. Steer. *Electroplating,* v. 1, Feb. 1948, p. 153-165.

8-43. Metallic Coating of Wire. Herbert Kenmore and Frank L. Durr. *Wire and Wire Products,* v. 23, Feb. 1948, p. 135-138.

Methods previously developed and a new method, the Kenmore process, for electroplating wire of various metals and alloys with different metals by a continuous, automatic process. Plating of Ni-coated, low-carbon steel wire. Other present and potential applications.

8-44. Plating Plastics; Practical Copper Reduction on Nonconductors. H. Narcus. *Metal Industry,* v. 72, Feb. 13, 1948, p. 128-129.

Previously abstracted from *Metal Finishing,* v. 45, Sept. 1947, p. 64-67, 70. See item 8-140, R.M.L., v. 4, 1947.

8-45. Plating Zinc Die-Castings; Pretreatment Prior to Bright Nickel Deposition. (Concluded.) P. Berger. *Metal Industry,* v. 72, Feb. 13, 1948, p. 129-130.

See abstract of first installment, item 8-32.

8-46. Anodic Coatings on Aluminum and Their Protective Value. D. M. McLachlin and H. P. Godard. *Canadian Chemistry and Process Industries,* v. 32, Feb. 1948, p. 124-128.

A descriptive review. 24 ref. (Presented at Montreal Regional Conference of Protective Coatings Division of the Chemical Institute of Canada, March 1947.)

8-47. A Detailed Description of the New Continuous Electrotinning Plant Now in Operation at the Ebbw Vale Works of Richard Thomas & Baldwins Ltd. D. G. P. Paterson. *Sheet Metal Industries,* v. 25, Feb. 1948, p. 311-320.

Uses "Ferrostan" process developed by Carnegie-Illinois Steel Corp.

8-48. Porous-Chromium Hardening of Diesel Engine Cylinders. C. D. B. Williams. *Engineering,* v. 165, Feb. 6, 1948, p. 139.

Recommended procedure which is based on the work of H. van der Horst, a Dutch engineer. An electrodeposition method is used to produce the chromium layer. Production of the proper type of porosity is very important. Surface preparation and honing of the plated cylinder bore. (Paper presented at meeting of Diesel Engine Users Assoc., London, Jan. 15, 1948.)

8-49. Electroforming Parts With High Strength. *Product Engineering,* v. 19, March 1948, p. 145. Condensed from "The Electroforming Process", William Orbaugh, *Rose Technic,* v. 58, Oct. 1947.

The process and its economics, and the strength and design of electrodeposited parts.

8-50. Rectifiers for Electroplating—Part V. Louis W. Reinken. *Metal Finishing,* v. 46. March 1948, p. 57-61.

Automatic stabilization; voltage and current stabilization; theory of stabilizer design; theory of automatic current stabilization; stabilization of rectifier banks; and economic considerations.

8-51. Production Clinic for Finishing Die Castings. *Die Castings,* v. 6, March 1948, p. 59-60, 62.

Reviews several recent papers on plating range tests and one on barrel plating of Zn-base die castings.

8-52. A New Method for Magnetic Measurement of the Thickness of Composite Copper and Nickel Coatings on Steel. Abner Brenner and Eugenia Kellogg. *Plating,* v. 35, March 1948, p. 242-246.

The method described greatly widens the field for nondestructive testing of plated deposits originated by the senior author through his development of the Magne-gage in 1937. By measuring the attractive force between the specimen and two permanent magnets of different strengths and use of a set of calibration curves, total thickness of the deposit and relative thickness of Cu and Ni layers can be measured with fair accuracy.

8-53. Electroplating From Fluoborate Solutions. Part I. Copper. Karl S. Willson, A. H. DuRose, and D. G. Ellis. *Plating,* v. 35, March 1948, p. 252-254, 304.

Only relatively recently have commercial installations of fluoborate plating baths been seriously considered. Results tend to confirm previously published data, with some modifications, and to extend knowledge concerning this type of bath. Voltages and limiting current densities; lead corrosion by fluoborates; effects of sodium, potassium, iron, and manganese; methods for bath control; and effect of bath type on grain size of deposit.

8-54. Notes on Laboratory Control of Plating Solutions. R. B. Saltonstall. *Plating,* v. 35. March 1948, p. 257.

A brief general discussion.

8-55. Determination of Impurities in Electroplating Solutions. Part VIII. Traces of Sodium and Potassium in Nickel Plating Baths. Earl J. Serfass, W. S. Levine and J. E. Oyler. *Plating,* v. 35, March 1948, p. 260-263, 297.

Details of development of a flame-photometer method for rapid and accurate determination of traces of Na and K in Ni-plating baths when appreciable quantities of Al, Ca, Cu, Cr, Pb, Mn, Fe, SiO_2, Zn, and Ca are present as impurities.

8-56. Process Sheet for Decorative Chromium Plating. George Black. *American Machinist,* v. 92, March 11, 1948, p. 203.

Steps required for applying chromium to a buffed nickel surface.

8-57. Plating Room Health Hazards. *Metal Finishing,* v. 46, March 1948, p. 89.

Data sheet presents outline of hazards for vapor degreasing; alkaline cleaning; pickling, bright dipping, passivating; chromium plating and anodizing; and cyanide solutions.

8-58. Rapid Electropolish and Etch. Albert De Sy and Herman Haemers. *Metal Progress,* v. 53, March 1948, p. 368-371.

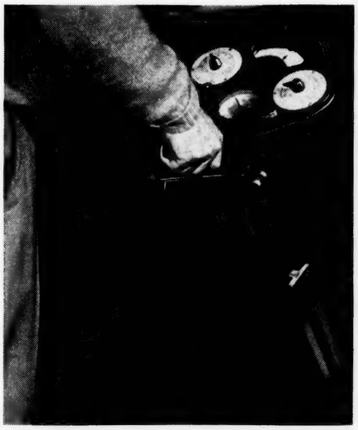
Belgian originators of process for

(Turn to page 22)

baking for 2 hr. at 400° F. The finished core has good collapsibility, and no gas is formed at the molten metal temperature.

Sand Testing

Several instruments have been perfected during the course of the year for rapid determination of moisture content of foundry sand. Harry W. Dietert Co.'s Moistmeter **(385)** is based upon the fact that the electrical conductivity of a particular sand



Dietert Moistmeter

will depend upon the moisture content—provided the sand is compacted to a predetermined mold hardness and the temperature is held constant or suitable compensation is made.

In the Moistmeter, two arms forming a pair of tongs are mounted to a housing containing the metering devices. On the end of the fulcrumed arm is a curved sampling plate in which the sand is trapped and squeezed to a definite hardness against the stationary arm when the operator releases the lever. The tip of the statinonary arm contains two electrodes, and also a dial thermometer stem to measure the sand temperature, so that compensation can be made at the metering head. Measurements can be taken either at the surface of the sand, in a sample can as small as a quart, or 25 in. below the surface in a sand pile or bin. (Literature available.)

The Thwing-Albert moisture meter **(386)** is a battery-operated instrument that is also based on the change in resistance to flow of an electric current with change in moisture content. It is calibrated by weighing the material to be tested, and then measuring its electrical resistance. This process is repeated with varying amounts of moisture until the range of the instrument has been covered. The zero of the scale is based on the electrical resistance of the material while in an oven-dry condition. The instrument is readied for operation by one simple adjustment, which suffices for several hours of operation. Thwing-Albert Instrument Co.

Another new instrument is called the Electric Hygro-Cel, invented by American Instrument Co. **(387)** for checking dryness of molds. By placing the Hygro-Cel in contact with the surface of the mold, the evaporation of moisture can be accurately measured. Tests on sand-cement molds show that the best time to pour is when the evaporation from the surface of the mold drops to approximately zero. Operating principle is based on the ability of a hygroscopic film to change its electrical resistance instantly with micro changes in moisture content.

Laboratory Equipment Corp.'s moisture determinator **(388)**, based on the amount of acetylene gas generated by bringing moisture of the sample in contact with calcium carbide, was described in the December 1947 issue of *Metals Review*.

A new mold hardness tester is also being marketed by Harry W. Dietert Co. **(389)**, based on the fact that a definite relationship exists between mold hardness and green strength of molding sands. A small, dial-face hand instrument, it reads in both mold hardness and mold strength.

Handling and Maintenance Equipment

An entire article could doubtless be devoted to materials handling equipment suitable for use in the foundry, but space permits mention of only a few specialized products.

Hutchinson Co. **(390)** has designed a cradle tong to pick up and carry crucibles without crushing the sidewalls. Four cast steel pads, supported by a ring, carry the crucible. The pads are lifted by lever, the tong is dropped over the crucible and a crossbar stops it at the proper height.

Palmer-Shile Ventilated Box

The levers are released and the pads drop into place. The reverse procedure releases the tong.

A heavy-duty all-steel ventilated box for foundry applications where

(*Turn to page* 23)

Yale & Towne Adjustable Core Rack and Hand Truck

For Bulletins and Further Information, Use Reader Service Coupon on Page 23

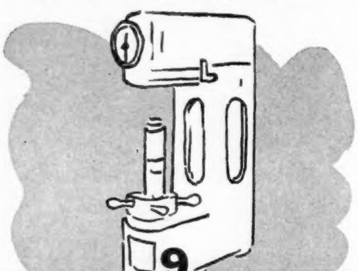
electropolishing metallographic specimens describe the make-up of the "standard" solution of perchloric acid and denatured alcohol. It is capable of a good etch in 30 sec. Several examples of the results are presented.

8-59. Materials and Requirements for Decorative and Protective Plating. Nelson G. Meagley. *Materials & Methods*, v. 27, March 1948, p. 80-82.

8-60. Zinc Contamination; Methods of Purification of Bright Nickel Plating Solutions. H. D. Carter. *Metal Industry*, v. 72, Feb. 27, 1948, p. 170-173.

Dark deposits that occur in low current density areas on Mazak No. 3 die castings are caused by contamination of the plating solution by zinc. In order to obtain further information on the removal of Zn contamination, a series of investigations was carried out, results of which are described. 11 ref.

For additional annotations indexed in other sections, see: 3c-11; 4d-3; 11-58; 27a-38.



9 PHYSICAL and MECHANICAL TESTING

9a—General

9a-20. Testing the Superalloys. T. Y. Wilson. *Instrumentation*, v. 3, 1st Quarter, 1948, p. 12-13.

Methods used by Allegheny Ludlum high alloy laboratories.

9a-21. Fatigue Testing With Particular Reference to Tests at Elevated Temperatures. J. McKeowen. *Journal of the Birmingham Metallurgical Society*, v. 27, Dec. 1947, p. 423-432; discussion, p. 432-442.

The effect of temperature on fatigue properties as well as the effects of rate of strain and conditions of stress and strain. Data of Moore and colleagues and of Fergusson and Bouton relative to effect of number of cycles of strain per hour on life of lead specimens. Also describes the Wöhler tests—rotating specimen with specific stress and nonrotating specimen with specific strain.

9a-22. A Micro-Indenter for Use With a Metallurgical Microscope. T. A. Crawshaw. *Journal of Scientific Instruments and of Physics in Industry*, v. 25, Jan. 1948, p. 13-14.

Simple device can be attached to a metallurgical microscope in order to make small impressions with a standard Vickers pyramid diamond.

9a-23. Two New British Microhardness Testers. *Industrial Diamond Review*, v. 8, Feb. 1948, p. 59-60, 62.

9a-24. Calculation of the Moment of Torsion Failure by Use of a Diagram of True Stresses. (In Russian.) M. P. Markovets. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Dec. 1947, p. 1476-1481.

Proposes a new formula for determination of the moment for cylindrical metal rods which exhibit shearing fracture during tensile and torsion testing.

9a-25. Apparatus for Determination of the Hardness of Metals. (In Russian.) A. V. Antonovich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Dec. 1947, p. 1501-1502.

A new apparatus for determination of Brinell or Vickers hardness, which has the advantage of greater portability than other types. The unique feature of the equipment is application of the load by means of a calibrated spring. The microscope, which is an integral part, permits measurement of the impression with an accuracy of ± 0.0001 mm. Disadvantage is necessity for frequent recalibration.

9a-26. Lock Washer Torsion Test Provides Unmistakably Clear Results. *Steel*, v. 122, March 15, 1948, p. 126.

Improved apparatus developed by Westinghouse.

9a-27. Adams Lecture for 1947—Structural Strength of the Welded Joint. G. S. Mikhalapov. *Welding Journal*, v. 27, March 1948, p. 193-206.

Tests designed to study the mechanism of failure in the welded joint. Data on wide-plate and hatch-corner tension-test specimens. Studies of high-velocity impact using direct-explosive tests made on welded and unwelded plates. (Presented at 28th annual meeting, A.W.S., week of Oct. 19, 1947.)

9b—Ferrous

9b-8. The Significance of Mechanical Testing. H. E. Davies. *Journal of the Birmingham Metallurgical Society*, v. 27, Dec. 1947, p. 412-422; discussion, p. 434-442.

Tensile, ductility, and shock-resistance tests of ferrous materials.

9b-9. Determination of the Breaking Strength of Hard Annealed Steel. (In Russian.) G. N. Margolin, B. A. Prozdovskii, and P. I. Orlets. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Nov. 1947, p. 1387-1399.

The causes of the failure of the breaking strength of notched specimens using an isostatic test to agree with that resulting from the Charpy impact test were thoroughly investigated and were found to be related to several metallurgical factors. The data obtained.

9b-10. Determination of the Mechanical Properties of Steel Without Use of Tensile Specimens. (In Russian.) M. F. Sichikov, B. P. Zakharov, and Iu. V. Kozlova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Dec. 1947, p. 1463-1471; discussion, p. 1471.

The possibility of indirect determination of the four basic factors involved in mechanical strength (tensile strength, yield point, per cent elongation, and per cent reduction of area) by use of a cone indenter was investigated theoretically and experimentally. Results so far are favorable, but further work is needed for complete verification. The editor comments adversely.

9b-11. Comparative Results of Impact Tests on Solid and Composite Test Specimens. (In Russian.) G. I. Pogodin-Alekseev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Dec. 1947, p. 1472-1475.

The solid specimens were 10 x 10 mm. in cross section. The composite ones consisted of two 10 x 5 mm. specimens, butt welded together or joined together in other ways either parallel to the direction of load application or perpendicular to it. Results for different types of steel are tabulated and charted. They are of value in determining the strength of machines or structures in which the simple forms investigated are likely components.

9b-12. The Correlation of Laboratory Tests With Full-Scale Ship Plate Fracture Tests. E. P. Klier, F. C. Wagner and M. Gensamer. *Welding Journal*, v. 27, Feb. 1948, p. 71s-96s; discussion, p. 96s.

Notch-impact tests conducted on merchant vessel quality ship plate. Tests have been conducted so as to establish the energy absorption vs. temperature curves for selected steels having widely separated temperatures of transition from ductile to brittle failure. Microstructure of the steels used. 18 ref.

9b-13. Development of Cleavage Fractures in Mild Steels. A. B. Bagsar. *Welding Journal*, v. 27, March 1948, p. 97s-123s.

Susceptibility of several types and thicknesses of mild steel of ship plate and pressure vessel qualities and of samples of welds to development of cleavage or brittle fractures has been determined by a new test, termed the cleavage-tear test, in which a notched tensile-bend type of test coupon is used. (Presented at annual meeting, Atlantic City, Dec. 1-5, 1947, of the American Society of Mechanical Engineers.)

9b-14. Cleavage Fracturing and Transition Temperatures of Mild Steels. A. B. Bagsar. *Welding Journal*, v. 27, March 1948, p. 123s-131s.

Effects of eccentricity of loading, section depth and thickness, notch geometry, temperature of testing, rate of loading, and heat treatments as determined by a cleavage-tear test. Several grades of ship plate and pressure vessel steels of rimmed, semikilled, and killed qualities covering a thickness range of ½ to 2¼ in. and several sections of butt welds made by manual and submerged-arc processes were investigated. Equations were derived expressing combined effects of section and notch geometries on development of cleavage fractures.

9b-15. Some New Aspects of the Fatigue of Metals Brought Out by Brittle Transition Temperature Tests. C. W. MacGregor and N. Grossman. *Welding Journal*, v. 27, March 1948, p. 132s-143s; discussion, p. 143s-144s.

Effect of prior cycles of fatigue on brittle transition temperature and on brittle fracture strength are determined for S.A.E. 1020 steel. Notched fatigue specimens were fractured at appropriate transition temperatures in a special slow-bend testing machine at controlled strain rates after being subjected to various numbers of cycles of fatigue at several stress levels. It was found that as the number of cycles at a given stress level (both above and below the endurance limit) increased, brittle transition temperature increased through a broad range of temperatures, and brittle fracture strength decreased greatly. 36 ref.

9b-16. The Effect of Variation in Notch Severity on the Transition Temperature of Ship Plate Steel in the Notched-Bar Impact Test. R. S. Zeno and J. R. Low, Jr. *Welding Journal*, v. 27, March 1948, p. 145s-147s.

An investigation made to determine transition temperatures of two ship plate steels for various notch severities in the Charpy impact test. Standard Charpy specimens that ranged from square, unnotched bars to standard V-notch bars containing shallow fatigue cracks at the bottom of the notch were used.

9b-17. Supplementary Statement on "A Comparison of the Brittle Transition Temperatures as Determined by the

(Turn to page 24)

FOUNDRY EQUIPMENT

uniform cooling is a requirement is a new product of the Palmer-Shile Co. **(391)**. The sand drains through the steel mesh sides of the box and can be used again. Stacking guides are welded on all four corners.

An angle-iron rack which can hold a large number of odd-shaped green cores is one of many specialized products of Yale & Towne Mfg. Co. **(392)**. The rack is used with a hand truck to haul quantities of cores from the coremaker to the bake ovens. The shelves can be raised or lowered to accommodate various sized cores.

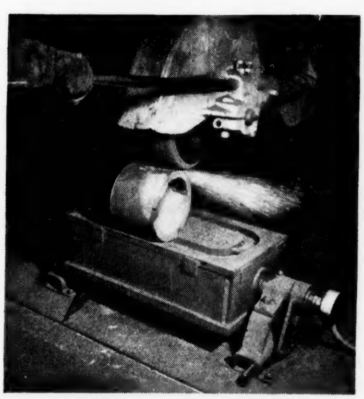
For handling awkward castings, Yale & Towne has placed a boom-and-hook attachment on a fork lift truck **(393)**. The hook has an outreach of approximately 4 ft. and can lift loads up to 18,000 lb.

Electromagnets make handy anchors for holding heavy castings under a swing grinder. The Hold-Tite magnet, developed by Dings Magnetic Separator Co. **(394)** is said to reduce grinding time as much as 25%. The wearing plate on which the castings are placed is renewable. Stearns Magnetic Mfg. Co. **(395)** also has a holding magnet available in various sizes with optional control apparatus.

Following the trend toward clean foundries, Spencer Turbine Co.'s improved portable vacuum cleaner **(396)** is a useful piece of equipment. Powered by a 1½-hp. motor, it has a large 1½-cu. ft. dirt can which may be rolled away on casters for emptying. A wet separator is available for collection of wet materials and liquids. (Literature available.)

Where acids and fumes attack walls and floor finishes, a synthetic paint protects concrete surface with a corrosion and abrasion resisting finish. It is marketed by Lowebco, Inc., under the fanciful name "Oncrete for Concrete" **(397)**.

Information about dust collection may be obtained from four manufacturers who have announced new or improved equipment for this all-important foundry function. They are Torit Mfg. Co. **(398)**—self-contained collectors that may be moved from one place to another as needed; Pulverizing Machinery Co. **(399)** — a unit that uses a wool felt bag kept free from clogging by a ring moving up and down its outer surface; Aget-Detroit Co. **(400)**—equipment made with a stack-connecting sleeve for exhausting cleaned air outside where required; and Kirk & Blum Mfg. Co. **(401)** — a semi-automatic self-contained dust control unit.



Dings Magnetic Holder

Treatment of Castings

Preheating of gray iron castings prior to welding and subsequent annealing is accomplished in a single furnace designed and constructed by Holcroft & Co. **(402)**. The heaviest piece processed weighs 235 lb. The furnace is so arranged that castings are preheated along one row and discharged for welding. After welding, they are reintroduced to the furnace in a counterflow row for stress-relief heat treatment. The heat evolved as the casting cools in the stress relief helps heat the adjacent row of castings being preheated.

A controlled atmosphere malleable annealing furnace, fired by radiant tubes, has been designed by Holcroft & Co. to use a minimum of floor space **(403)**. It is elevated 7½ ft. above floor level so that the area directly beneath the furnace can be used for working space. Stock is charged and discharged by elevators at both ends, and is moved through the furnace by hydraulic pushers. The annealing cycle is essentially the same as that described in *Metal Progress* for October 1947, page 623.

Practical procedures for salvaging cast iron, bronze, aluminum and malleable iron castings are set forth in a two-page bulletin issued recently by Eutectic Welding Alloys Corp. **(404)**. How to seal leaks and cracks, treatment of complicated light and heavy castings, and welding for color match, high tensile strength or machinability are described.

Coming!
May — Testing and Inspection Equipment
June — Cleaning, Finishing and Plating Equipment
Contributions will be welcomed

Leon Slade Is Auto Victim

Leon D. Slade, 73, a long-time member of the Rochester Chapter A.S.M., died on Feb. 29 as the result of a fractured skull, shock and hemorrhage sustained in an automobile accident. Mr. Slade came to Rochester 45 years ago and went to work for the Gleason Works as metallurgist. He retired three years ago.

READER SERVICE COUPON

Check These Numbers for Production Information and Manufacturers' Catalogs. These following numbers refer to the new products and bulletins listed in the article on "Foundry Equipment" starting on page 11.

THIS COUPON IS VOID AFTER JULY 1, 1948

Metals Review, April 1948

332	333	334	335	336	337	338	339	340	341	342	343	344	345
346	347	348	349	350	351	352	353	354	355	356	357	358	359
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Charpy Impact and the M.I.T. Slow-Bend Tests". C. W. MacGregor and N. Grossman. *Welding Journal,* v. 27, March 1948, p. 159s-160s.

Refers to article published in Jan. issue. Gives additional information.

9b-18. Measurement of Breaking Energy in Notched Rail Impact Test. M. Perrey. *Engineers' Digest,* v. 5, Feb. 1948, p. 85-87. Translated and condensed from *Revue de Métallurgie,* v. 43, 1946, p. 336-346.

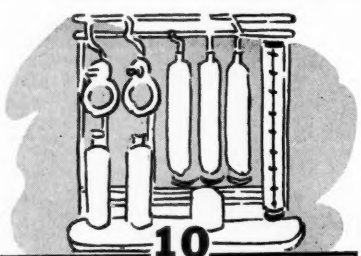
Previously abstracted from original paper. See R.M.L., v. 4, 1947, item 9-124.

9d—Light Metals

9d-2. Dependence of the Heat Resistance of Aluminum Alloys on Their Composition and Structure. (In Russian.) A. A. Bochvar. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the U.S.S.R., Section of Technical Sciences), Oct. 1947, p. 1369-1384.

A rapid auxiliary method for high-temperature performance determination is proposed, based on the gradual change, with time of loading, of the size of impressions obtained by forcing a macro or micro-indenter under constant load into the specimen. On the basis of data obtained by the above method and also by standard creep testing, it is believed that the heat resistance of alloys results from heterogeneity of their crystal structures, and also may be caused by the formation of screen or skeleton-like inclusions of solid phases on the grain boundaries.

For additional annotations indexed in other sections, see:
3a-26; 11-61; 24a-48; 24b-33-34-39.



10 ANALYSIS

10a—General

10a-22. The Determination of the Oxygen Content of Metals by the Carbon Monoxide Method. D. Lipkin and M. L. Perlman. *U. S. Atomic Energy Commission,* MDDC-294; LADC-142, Feb. 3, 1944, 15 pages.

Technique and apparatus using vacuum fusion in graphite and analysis of the gases evolved.

10a-23. A New Method for the Direct Precipitation of Aluminum in the Presence of Iron. (In English.) H. N. Wilson. *Analytica Chimica Acta,* v. 1, Nov. 1947, p. 330-336.

Aluminum can be precipitated as benzoate from solutions containing up to 1 g. of iron in the presence of thioglycollic acid, which reduces the iron and forms a soluble complex with ferrous iron. Very large amounts of such salts as ammonium chloride, sulphate, and perchlorate, and sodium chloride, do not interfere, nor do other divalent metals. Molybdates and tungstates are without effect, but chromium, vanadium and titanium interfere.

10a-24. Perfectionnement a la Methode d'Analyse des Oxydes Metalliques par Réduction Electrolytique. (Improvement of the Method of Analysis of Metallic Oxides by Electrolytic Reduction.) Jean Besson. *Comptes Rendus* (France), v. 225, Dec. 10, 1947, p. 1154-1156.

Electrolytic reduction of a given amount of thallium peroxide was performed at decreasing current densities. From corresponding curves, the limiting value for zero intensity was determined. The method is applicable to other metallic oxides.

10a-25. How to Separate Alloys by Spot Testing. H. Kirtchik. *Steel,* v. 122, Feb. 23, 1948, p. 91, 106.

Use of nonspecific reagents is shown to be a quick method of determining presence of certain elements in both ferrous and nonferrous alloys.

10a-26. Colorimetric Determination of Iron With 4-Hydroxybiphenyl-3-Carboxylic Acid. John H. Yoe and Aubrey E. Harvey, Jr. *Journal of the American Chemical Society,* v. 70, Feb. 1948, p. 648-654.

Use of 4-hydroxybiphenyl-3-carboxylic acid as an agent for detection of traces as small as 1 in 40 million. Ti does not interfere. Data for a large number of other cations show only a few cases of interference. Quantitative range is 0.2-1.0 p.p.m. Data for determinations in feldspar, glass sand, dolomite, silica brick, glass, and sheet brass illustrate applicability and accuracy. 35 ref.

10a-27. Thorium in Monazite Sand; Separation and Determination by Precipitation From Homogeneous Solution. Hobart H. Willard and Louis Gordon. *Analytical Chemistry,* v. 20, Feb. 17, 1948, p. 165-169.

New method claimed to be more accurate and rapid than those previously described. 22 ref.

10a-28. Mercury Cathode Cell for Rapid Electrolysis. F. T. Rabbitts. *Analytical Chemistry,* v. 20, Feb. 17, 1948, p. 181-182.

Improved apparatus which is said to be more adaptable to control and research work and to require much less time for electrolysis in analysis of metals and ores. 10 ref.

10a-29. The Determination of Sulphate as Barium Sulphate. William H. Millett and Wallace M. McNabb. *Journal of the Franklin Institute,* v. 243, March 1947, p. 205-217.

A comparison was made of results obtained after the removal of the above metals with those which were obtained by direct precipitation in the presence of the metallic ions. The metals considered were cadmium, mercury, bismuth, copper, antimony, arsenic and tin. 10 ref.

10b—Ferrous—Base Metals

10b-15. Semi-Quantitative Spot-Test Analysis of 18-8 Cr-Ni Steels. (In English.) A. Claeys and J. Gillis. *Analytica Chimica Acta,* v. 1, Nov. 1947, p. 364-370.

Procedures for surface preparation of the samples and for estimation of chromium, nickel, molybdenum and titanium.

10b-16. Methods for Separation of Carbides From Ferrous Alloys. (In Russian.) G. A. Medvedeva. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Dec. 1947, p. 1413-1421.

Existing methods are critically reviewed. Experimental work indicates that an electrolytic method developed by the author results in the most complete separation of carbides.

10b-17. Gravimetric Determination of the Carbide Phase in Carbon Steels. (In Russian.) N. M. Popova and M. F. Rybina. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Dec. 1947, p. 1421-1425.

Experimental investigation of the electrolytic method described showed that it results in complete separation of carbides from steels containing less than 1% in any structure resulting from heat treatment.

10b-18. Method for Determination of Carbides in Alloy Steels. (In Russian.) M. M. Shapiro. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Dec. 1947, p. 1425-1430.

An electrolytic method which is particularly applicable to high speed steels and which eliminates the influence of oxidation and adsorption during electrolysis.

10b-19. Determination of Hydrogen in Steel. (In Russian.) A. N. Morozov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Dec. 1947, p. 1485-1487.

Existing methods were compared.

10b-20. The Sampling and Analysis of Steel for Hydrogen. G. Derge, W. Poifer, and J. H. Richards. *Blast Furnace and Steel Plant,* v. 36, March 1948, p. 343-344, 355, 362. A condensation.

Methods of sampling and analysis which have been developed and their usefulness and limitations. Application to the behavior of hydrogen in rail steel. (Presented at A.I.M.E. meeting, New York, Feb. 15-19, 1948.)

10c—Nonferrous—Base Metals

10c-13. The Cerimentric Determination of Copper and Antimony. (In English.) R. Pribil and T. Chlebovsky. *Collection of Czechoslovak Chemical Communications,* v. 12, Sept.-Oct. 1947, p. 485-501.

Results of a study of the conditions for the cerimetric determination of copper following its reduction to the univalent state by a solution of chromous chloride. Methods for the determination of copper in alloys (brass, bronze) and for the determination of copper, antimony, and arsenic in alloys of lead and tin are presented.

10c-14. Determination of Manganese in Nickel, Cupro-Nickel, Nickel-Silver and Brass. M. Brut. *British Chemical Digest,* v. 2, Feb. 1948, p. 169-170. Translated and condensed from *Chimie Analytique,* v. 29, March 1947.

Two volumetric procedures.

10c-15. The Analytical Aspects of Thorium Chemistry. Therald Moeller, George K. Schweitzer, and Donald D. Starr. *Chemical Reviews,* v. 42, Feb. 1948, p. 63-105.

A review. 276 ref.

10c-16. Removal of Metals at the Mercury Cathode; Separation of Interfering Metals in the Determination of Aluminum, Alkaline Earth, and Alkali Metals. Thomas D. Parks, Hilton O. Johnson, and Louis Lykken. *Analytical Chemistry,* v. 20, Feb. 1948, p. 148-151.

Methods are based on the use of a previously described unitized mercury-cathode apparatus suitable for industrial analytical applications. Procedures are given for the removal of 0.5 to 5.0-gram quantities of easily removable metals such as Fe, Cu, Zn, Ni, Co and for the removal of somewhat smaller quantities of Cr, Pb, Sm and Mo which are not deposited under ordinary conditions. Results demonstrate the satisfactory extent to which these metals are removed and indicate optimum values of such factors as voltage, current, surface area of the mercury, distance between elec-

(Turn to page 26)

Ten Years of Development Work Preceded Welded High-Strength Bomb

Reported by H. L. Millar

How it took ten years of development work in the A. O. Smith research laboratories to produce the tools and "know-how" necessary for flash welded and arc welded bombs of high tensile properties, capable of absorbing high impact loads without shattering, was described in Los Angeles on Jan. 22. Merrill A. Scheil, director of metallurgical research for A. O. Smith Corp., Milwaukee, addressed a joint meeting of the Los Angeles Chapters of the A.S.M. and the American Welding Society on "Metallurgy and Welding".

At the Joint Meeting of the Los Angeles Chapters of A.S.M. and American Welding Society Are, Left to Right: A. Fenlason, A.W.S. Chairman; E. D. Williams, A.W.S. Vice-Chairman; J. J. Chyle, director of Welding Research for A. O. Smith Corp., Who Led the Discussion; Orrin Andruss of A. O. Smith Corp., Technical Chairman; Merrill A. Scheil, Director of Metallurgical Research for A. O. Smith Corp., the Main Speaker; E. R. Babylon, A.S.M. Vice-Chairman; and Edgar Brooker, A.S.M. Chairman

A highlight of the bomb program was the development of weld metal for a 6-in. welded section with over 160,000 psi. tensile, 120,000 psi. yield point, 16% elongation, and Charpy impact of 22 ft-lb. at 32° F. The speaker estimated that recourse to heat treatment on medium manganese steel for general-purpose bombs at his company made available over 16,000,000 lb. of nickel, 8,000,000 lb. of chromium and 4,000,000 lb. of molybdenum for other war products. The flash welds in each cylinder for bomb bodies could be upset from ½ to 3 in.—a remarkable tribute to the "art of flash butt welding".

Torpedo Flasks Fabricated

Welded, heat treated air flasks for aerial, submarine, and deck discharge torpedoes were fabricated in a special plant at the Milwaukee Works. These flasks were put through some unusual tests. Charged with 3000 lb. of air, they were subjected to tumbled .50-caliber machine gun fire, 20-mm. A.P. shot, drop tests of 150 ft. at −10° F. into a stone quarry, and burst tests under hydrostatic pressure. No premature failures in the welds developed. A baked phenolic resinoid coating was applied to the inside flask surfaces for corrosion resistance.

Another important wartime development was the flash welded "Smithway" hollow steel propeller blade. The blades were manufactured from seven different parts of 4340 alloy steel, forged, coined or rolled directly to size, and then assembled by flash butt welding. The blades were heat treated and quenched in a water-cooled contour die with inert gas under pressure in the blade, so that they were pressed to shape and heat treated at the same time.

The Smith Corp. also designed and built landing gear for the B-29. These gears were formed from ½-in. plate, hot pressed, and joined by arc welding to small, easily procurable forgings. The weldments were heat treated to 180,000 psi. minimum tensile strength, welded with austenitic 25% Cr, 20% Ni steel, and stress-relieved at 50° F. below the lowest tempering temperature of the heat treated parts.

The last development Mr. Scheil described was the Smithway "Unit-Built" welded crankshaft, 15 3/8 in. in diameter and weighing 23,500 lb. The basic design employs drop forged individual cheeks or half-throws, welded with an annular groove in such a manner that it was possible to control very accurately not only the angular relation of the crankpins, but also the effect of shrinkage upon the length of the shaft. The final stress-relieving was done with the shaft in a horizontal position, turned slowly.

The meeting was followed by a lively discussion in which J. J. Chyle, director of welding research for A. O. Smith Corp., took part. Mr. Chyle predicted that electrodes would be available for welding 1045 steel with 0.40 to 0.50% carbon in the weld metal.

X-Ray Diffraction Has Wide Metallurgical Uses

Reported by R. E. Tate
N. E. P. A. Division
Fairchild Engine and Airplane Corp.

Fred E. Bowman of the N.E.P.A. Division of Fairchild Engine and Airplane Corp. outlined the theory of X-rays and X-ray diffraction and pointed out the remarkable strides this young science has made in metallurgy and related fields. Dr. Bowman addressed the March meeting of the Oak Ridge Chapter A.S.M.

The discovery of X-rays in 1895 by Roentgen and of the diffraction of X-rays in 1912 by Laue led to a wealth of information of metallurgical interest. The crystalline structures of metals and alloys were determined. Alloy systems were studied by means of X-ray diffraction for solubility limits and transition temperatures. Techniques were worked out for determining grain size, estimating recrystallization temperatures, observing orientation effects due to forming operations, and measuring strains in worked metals.

The more prominent methods of X-ray diffraction—namely, the Laue method, the rotating crystal method, the powder method, and the back reflection method—were discussed by Dr. Bowman and slides of some commercial X-ray equipment shown.

trodes, and time of electrolysis. 10 ref.

10c-17. Volumetric Estimation of Thallium. B. C. Mehrotra. *Nature,* v. 161, Feb. 14, 1948, p. 242.

Use of bromphenol blue as indicator.

10c-18. Sulphur Determination; Volumetric Method for Copper-Base Alloys. M. Sherman. *American Foundryman,* v. 13, March 1948, p. 52-53.

After evaporating to fumes with perchloric acid, the sulphuric acid is reduced with a mixture of hydriodic and hypophosphorus acid to hydrogen sulphide. The latter is distilled into an ammoniacal cadmium chloride solution and then titrated with potassium iodate.

10d—Lightweight—Base Metals

10d-7. Acidimetric Determination of Aluminum. A. H. Bushey. *Analytical Chemistry,* v. 20, Feb. 17, 1948, p. 169-172.

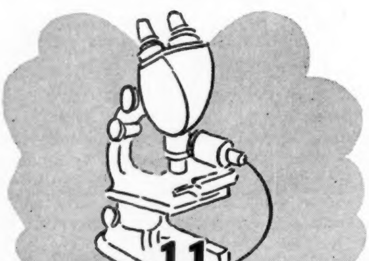
A caustic solution of aluminate is titrated with HCl from a pH of approximately 11 to 3. The point at which free caustic is neutralized and the reaction with aluminate starts is identified by potentiometric measurements. The end point at which conversion of aluminum to the chloride is complete is identified visually and also indirectly by an application of Scott's method with potassium fluoride. Accuracy and precision are discussed, as well as effect of interfering substances.

10d-8. Phosphoric Acid Attack Method for Determination of Silicon in Aluminum Alloys. George Norwitz. *Analytical Chemistry,* v. 20, Feb. 17, 1948, p. 182.

Method claimed to be an improvement upon the one described by Lisan and Katz (v. 19, 1947, p. 252).

For additional annotations indexed in other sections, see:

3b-40; 4b-16; 8-55; 15d-4; 26b-9; 27b-20.



11 APPARATUS, INSTRUMENTS and METHODS

11-37. Appareil Pour la Mesure Rapide de l'Epaisseur des Couches Superficielles. (Apparatus for Rapid Measurement of the Thickness of Surface Layers.) J. J. Trillat and H. Gervais. *Journal des Recherches du Centre National de la Recherche Scientifique, No.* 1, 1947, p. 41-43.

The apparatus described is based upon one observed in a British plant. It is used to measure the thickness of nonmagnetic layers on magnetic base metals with an accuracy of 0.01 mm.

11-38. Studio Delle Proprieta Elastiche Dell 'Alluminio con un Metodo Elettroacustico. (Study of the Elastic Properties of Aluminum by an Electro-Acoustic Method.) P. G. Bordoni. *Alluminio,* v. 16, Nov.-Dec. 1947, p. 495-502.

A method of measurement whereby the elastic parameters of solids and their internal friction may be determined accurately at various ambient temperatures. Data obtained in a preliminary research on the effects of impurities on the elastic properties of aluminum are given.

11-39. X-Ray Diffraction Cameras for Metallurgical Specimens. D. W. Davison. *Journal of Scientific Instruments and of Physics in Industry,* v. 25, Jan. 1948, p. 7-10.

Two types of cameras, one for "grazing-incidence" and one for back-reflection.

11-40. Report of the Electron Microscopy Conference — London, March 1947. *Journal of Scientific Instruments and of Physics in Industry,* v. 25, Jan. 1948, p. 23-27.

11-41. The Pulse Polarizer in Corrosion Research. Glenn A. Marsh. *Corrosion and Material Protection,* v. 5, Jan.-Feb. 1948, p. 15-20.

Instrument designed to provide reproducible data on the polarization of metals. Essentially it consists of a high-voltage d.c. source, a pulse discharge mechanism, a sensitive polarization detector, and a high-speed recorder. How such data are used to evaluate surface coatings, corrosion inhibitors, relative corrosivity of different chemicals or solutions, and other present and potential uses in corrosion and electrochemistry. 15 ref.

11-42. Balancing Rotating Parts. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 94-97.

Problems involved and methods used to do the job. Two Gisholt Dynetric balancing machines are used.

11-43. Dark-Field Electron Microscopy. Part I. Studies of Crystalline Substances in Dark Field. C. E. Hall. *Journal of Applied Physics,* v. 19, Feb. 1948, p. 198-212.

Dark-field images were studied by an objective aperture system fixed to the object rather than to the objective lens. The resolution in images produced by the diffusely scattered component is in the range 100 to 200 A, but the resolution in images produced by Bragg reflections approaches that obtainable in bright-field operation. A resolution of about 50 A was obtained with test objects consisting of evaporated films containing small crystallites but it is estimated that crystallites having dimensions down to about 20 A can be recorded. Substances studied included evaporated films of metals and compounds and finely divided materials. Theoretical factors influencing resolution. 32 ref.

11-44. Sieve Analyses of Powdered Metals Affected by Atmospheric Humidity. *Steel,* v. 122, Feb. 23, 1948, p. 89-90, 116.

Differences of as much as 10% between weights of fractions of powdered iron sieved in high and low-humidity atmospheres were observed by Bureau of Standards investigators.

11-45. Applications of the Magnetic Oscillograph. R. H. Cole. *Iron Age,* v. 161, Feb. 26, 1948, p. 74-77.

The instrument's possibilities and limitations and some of its unique applications in the metalworking industry.

11-46. X-Ray Thickness Gage. *Electronics,* v. 21, March 1948, p. 154, 156, 158, 160, 162, 164, 166, 168.

Circuit and application details of instrument designed by W. F. Lundahl of Westinghouse for measuring the thickness of cold rolled steel sheet and cold rolled copper. The instrument should also prove applicable for use on hot materials like metal and glass sheet, and fragile materials like foil and paper.

11-47. An A.C. Operated Mass Spectrograph of the Mattauch Type. A. E. Shaw and Wilfrid Rall. *U. S. Atomic Energy Commission,* MDDC-409, Oct. 28, 1946, 19 pages.

Mass spectrograph for chemical analysis of solid samples. The Mattauch arrangement of a 31° 50′ electric deflection followed by a 90° deflection in a magnetic field was used in order to obtain a large mass range in focus on one plate. Examples of the resolution with nickel ions.

11-48. Quantitative Relations Between the Photographic Response of X-Ray Films and the Quality of Radiation. Herman Hoerlin and Victor Hicks. *Non-Destructive Testing,* v. 6, Fall 1947, p. 15-19.

Experiments reported covered, in a general way, the sensitivities of three types of films to wave lengths ranging from those used in X-ray diffraction to those emitted by radium. In the main, unfiltered radiation was used. 10 ref.

11-49. Radiographic Film Processing Units. S. B. Page and H. F. Kaiser. *Non-Destructive Testing,* v. 6, Fall 1947, p. 22-23, 51. Reprinted from Report No. M-3004, X-Ray and Radiography Section, Metallurgy Division, Naval Research Laboratory, U. S. Navy.

Mass production unit designed to insure utmost quality, but with due regard to restrictions existing during the war on critical materials.

11-50. A Logarithmic Step Tablet for X-Rays. G. M. Corney and H. E. Seemann. *Non-Destructive Testing,* v. 6, Fall 1947, p. 27-30.

A method commonly used for rapid comparison of X-ray films consists in exposure of strips of the films beneath a stepped wedge, made up of equal steps of some metal such as aluminum or steel. Estimates of relative speeds are then made by placing the processed strips side by side, and comparing densities. This method is subject to several errors. Details of the design of a step tablet which is not subject to these errors. Typical data.

11-51. A Soviet Electron Microscope. (In Russian.) V. N. Vertsner. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Nov. 1947, p. 1364-1375.

A new type developed late in 1946, having a resolving power in the neighborhood of 20 A, or direct magnification of about 100,000, is described in considerable detail. Photographs, constructional and circuit diagrams, and representative micrographs obtained with it.

11-52. Methods of Investigation Using the Electron Microscope. (In Russian.) A. I. Frimer and S. L. Pupko. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Nov. 1947, p. 1375-1387.

Soviet methods. 29 ref.

11-53. Method for Determination of the Temperature Range of the Ac_1 Transformation in Steels. (In Russian.) I. N. Golikov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Dec. 1947, p. 1435-1440.

Improved method and apparatus for the above and results of its use on a series of plain-carbon and low-alloy steels (the latter containing up to 2.75% Cr or 5.17% Ni). The method is claimed to be very simple and accurate and to be applicable also to other structural transformations of steel.

11-54. Self-Printing X-Ray Diffraction Interplanar Scale. A. P. DeBretteville, Jr., and S. Benedict Levin. *Review of Scientific Instruments,* v. 19, Feb. 1948, p. 120-121.

(Turn to page 28)

Four Qualities Maintain Popularity Of Gray Cast Iron

Reported by L. Wiley Cooper
Iowa State College

Cast iron, according to Ralph Clark of the Electro Metallurgical Co., who addressed members of the Des Moines Chapter A.S.M. at their February meeting, is maintaining a high tonnage in the ferrous field because of its four favorable qualities, namely (*a*) wear resistance, (*b*) machinability, (*c*) vibration damping, and (*d*) relatively low cost.

Gray cast iron may be considered as a steel with the continuity of its matrix broken up by flake graphite. Variations in composition will affect the strength of the matrix, as well as the amount and distribution of the graphite phase. Variations in melting technique may produce different graphite distribution and also different microstructure of the matrix in irons of similar composition—with a great effect on the physical properties of the iron. The strength of a cast iron depends primarily upon:

1. The amount and distribution of the graphite flakes as affected by chemical analysis, cooling rate, processing during melting or pouring, and heredity of the raw materials from which it is melted.
2. Microstructure of the matrix as controlled by the chemical analysis and cooling rate.

This can be stated more simply as "How strong is the steel matrix?" and "How much is it weakened by the graphite?"

Usually, the main objective in producing high grade cast iron is not to secure the smallest possible size of graphitic carbon, but to obtain a random dispersion of moderate size flakes which will disturb the continuity of the matrix as little as possible. The utility of inoculation in accomplishing this result was demonstrated.

Mr. Clark discussed the effect of carbon content in controlling strength and casting qualities of the gray irons. While lowering the carbon content will strengthen the metal, such a change in analysis will reduce fluidity, increase the amount of residual stress, reduce damping capacity and increase the difficulty of producing metal of consistent analysis; for these reasons, carbon content should be no lower than required for a specific application.

The effects of the common alloys on cast iron were briefly covered. Mention was also made of the new British process whereby a spheroidal graphite structure is obtained. If this process turns out to be commercially practical, it should offer great possibilities to the iron foundry industry, Mr. Clark predicted.

DeLong Receives Stoughton Award

B. H. DeLong (Seated, Left) Is Congratulated by Prof. Bradley Stoughton on Receipt of the Stoughton Award of the Lehigh Valley Chapter A.S.M. Standing in rear are R. L. Deily, chapter chairman; M. C. Fetzer, vice-chairman; and C. B. Post, principal speaker of the evening

Reported by R. T. Saeger
Bethlehem Steel Co.

The annual Stoughton Night of the Lehigh Valley Chapter A.S.M. on Feb. 6 was highlighted by presentation of the Bradley Stoughton Award for outstanding work in the field of metallurgy. Recipient of this year's award was B. H. DeLong, who has just completed 40 years of service with Bethlehem Steel Co., of which he is president.

The technical talk of the evening, entitled "Air Hardening Tool and Die Steels" and presented by C. B. Post, metallurgist of Carpenter Steel Co., dealt with commercially available steels and their general characteristics on hardening. Data on internal stresses developed in water, oil and air hardening were cited to show the distortion and size change found in the three types of steels.

Examples of tools made from air hardening steels were shown and discussed from the standpoint of distortion, cracking hazard on heat treatment, size change, and uniformity of hardness in large sections.

Research Facilities for High-Temperature Alloys Inadequate, Says Feild

Reported by J. C. Selby
Metallurgical Department
Timken Roller Bearing Co.

High-temperature properties of steels and how they are determined formed the subject of the March meeting of the Canton-Massillon Chapter A.S.M. held at the Mergus Restaurant in Canton. O. J. Horger presided, and the speaker was A. L. Feild, associate director of research laboratories for the American Rolling Mill Co.

His explanations of the tests normally used to determine these properties were well illustrated by slides showing equipment and data. The test methods include oxidation, short-time tensile tests, stress-rupture, creep, and fatigue tests. The equipment necessary to conduct these tests at temperatures over 1200° F. was shown to be the result of considerable experimental work, and in some instances represented the composite work of several laboratories.

Mr. Feild also described in detail the different types of alloys used in high-temperature service, especially in gas turbines, and showed how the properties vary from one alloy to the next, as determined by the test methods previousy mentioned.

Each element in these alloys is added to convey a specific property. Straight chromium alloys, for example, are unexcelled for oxidation resistance, but have low strength at high temperature. By adding other elements in proper proportions the other needed properties may be secured.

Mr. Feild summarized his talk by reviewing the progress to date in the field of high-temperature alloys, and the future needs for still better alloys as demanded by the designers of turbines and other high-temperature, high-stress mechanisms. The need for research in this field cannot be met by the personnel and facilities presently available, he concluded; if a sudden need for better material should arise, as in the last war, we would again be caught short.

Instrument prints an interplanar scale in Angstrom units on one-half of an X-ray diffraction picture, thus enabling one to look at a diffraction picture and record directly values of interplanar spacings without measuring the diameter of the X-ray diffraction rings and solving the Bragg equation.

11-55. Methods of Hardening Rail Ends and Reconditioning Them to Control Rail Battering. R. P. Winton and Others. *American Railway Engineering Association, Bulletin,* v. 49, Feb. 1948, p. 398-404.

Instrument designed for measurement of profiles and batter of rail ends. Instructions for its use.

11-56. Precision Instruments; Methods of Developing Existing Standards of Accuracy. *Metal Industry,* v. 72, Feb. 20, 1948, p. 151-152. Based on paper by A. J. Philpot.

Several methods using magnification by conversion of one type of effect to another. (Presented to Royal Society of Arts.)

11-57. Nomographs for Computing Exponential Relationships. A. H. Canada. *General Electric Review,* v. 51, March 1948, p. 44-47.

How they can be used to resolve relationships used in infrared spectroscopy.

11-58. Laboratory Tests and Equipment (Concluded). J. B. Mohler and H. J. Sedusky. *Metal Finishing,* v. 46, March 1948, p. 76-83.

Various tests for evaluating the deposited metal. 24 ref.

11-59. Grain Orientation in Aluminum Revealed by Anodic Film. André Hone and E. C. Pearson. *Metal Progress,* v. 53, March 1948, p. 363-366.

Technique which will readily reveal individual grain orientations of Al and its alloys. It is also believed applicable to other metals, provided an anodic film can be formed whose optical properties are related to the orientation of the substrate. The film is applied to a surface which has been polished either mechanically or electrolytically. The film produced is uniform over the surface of any one grain, but varies from grain to grain as a function of orientation.

11-60. X-Ray Identification of Sigma Phase in 25-20 Cr-Ni Stainless. W. J. Barnett and A. R. Troiano. *Metal Progress,* v. 53, March 1948, p. 366-367.

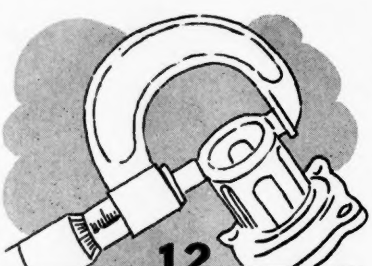
Technique developed for the identification of small amounts of the sigma phase in austenitic stainless steels, which alleviates the often uncertain results of present metallographic procedures and allows positive identification of a given microconstituent.

11-61. Bits and Pieces. *Metal Progress,* v. 53, March 1948, p. 371-373.

Marking of Lucite Mounts, by Joseph F. Cerness; Convenient Temporary Mount, by Henry Thompson; Etchant for Welds, by Gerard H. Boss; Proper Photography of Hardened Zones, by John J. Gibbons; Rapid Mounting of Specimens, by T. J. Lepito; and Grease Guard for Baldwin-Southwark Testing Machine, by T. S. Howald.

For additional annotations indexed in other sections, see:

4b-13-21; 8-52; 11-58; 22d-7.



12 INSPECTION and STANDARDIZATION

12a—General

12a-22. Importance of Radiography to Inspection. E. L. LaGrelius. *American Foundrymen's Assoc., Preprint No.* 47-16, 1947, 4 pages.

Application in foundry practice.

12a-23. One-Millionth Second Radiography and Its Development. Charles M. Slack and Louis F. Ehrke. *ASTM Bulletin,* Jan. 1948, p. 59-68.

The great reduction in exposure times which has been made since Roentgen's period and particularly the latest development which permits radiographs to be made through reasonable thicknesses of metal in one-millionth of a second. 11 ref. (Presented at joint Symposium on Ultra-High Voltage Radiography of A.S.T.M. Committee E-7 on Radiography and of the American Industrial Radium and X-Ray Society, Cleveland, Feb. 8, 1946.)

12a-24. Frankford Arsenal Experience With High-Speed Radiography. E. R. Thilo. *ASTM Bulletin,* Jan. 1948, p. 69-72.

(Presented at Symposium on Ultra-High Voltage Radiography sponsored jointly by A.S.T.M. Committee E-7 on Radiography and American Industrial Radium and X-Ray Society, Cleveland, Feb. 8, 1946.)

12a-25. Het Niet-Destructief Materiaalonderzoek. (Nondestructive Testing of Materials.) J. W. Holleman and W. A. Schultze. *Metalen,* v. 2, Jan. 1948, p. 93-97.

Nondestructive test methods usually applied in the control of technical materials. Possibilities and limitations of each method. Use of ultraviolet light in detecting cracks. 9 ref.

12a-26. Report of Committee on Standards for Machined Surface Finishes. Hugh B. Conover. *Iron and Steel Engineer,* v. 25, Feb. 1948, p. 62-63, 65.

Includes A.I.S.E. Standard No. 3.

12a-27. Table of Weights for Elliptical Bars. *Foundry,* v. 76, March 1948, p. 118.

Weights of elliptical bars of cast iron, steel, aluminum, copper, zinc, gun metal, and yellow brass in 1-in. lengths.

12a-28. Inspection Methods Using Magnaflux and Zyglo in Production Industries. W. E. Thomas. *Non-Destructive Testing,* v. 6, Fall 1947, p. 9-14.

Methods and their practical applications; a few of the general principles which apply in factory inspections; and how these methods are being applied in production. (Presented at National Conference on Production Inspection With Magnaflux and Zyglo, Detroit, Nov. 10-11, 1947.)

12a-29. Use of Radon for Industrial Radiography. A. Morrison. *Non-Destructive Testing,* v. 6, Fall 1947, p. 24-26. Reprinted from *Canadian Journal of Research,* v. 23, Sec. F, Nov. 1945.

12a-30. Precision Radiography at Two-Million Volts. E. Alfred Burrill. *Non-Destructive Testing,* v. 6, Fall 1947, p. 42-45, 47, 51. Based on Final Report of the M.I.T. Project in High Voltage Radiography, O.S.R.D. Report No. 4488, June 1945.

12a-31. Gaging of Precision Screw Threads. A. C. Pruliere. *Microtechnic,* v. 1, Dec. 1947, p. 126-129. (For figures see French section, p. 281-287.) Translated from the French.

Definitions relative to screw threads and the different American, British, and Continental standards. History of development of the various types and their standardization. Errors in threads and their significance. (To be continued.)

12a-32. The Comparator, Its Use, Its Working. B. Humbert. *Microtechnic,* v. 1, Dec. 1947, p. 131-134. (For figures see French section, p. 290-299.) Translated from the French.

A detailed description of the mechanisms of dial gages, especially Swiss ones.

12a-33. X-Ray Thickness Gage. W. N. Lundahl. *Western Metals,* v. 6, Feb. 1948, p. 48, 50-51.

New Westinghouse gage now operating on cold-rolled steel sheet and cold-rolled copper and believed applicable to other metallic and nonmetallic raw materials.

12a-34. Measuring Thickness Without Contact. Walter N. Lundahl *Westinghouse Engineer,* v. 8, March 1948, p. 42-43.

Electronic method developed at Westinghouse. (Condensed from paper presented at A.I.E.E. Midwinter Convention, Pittsburgh, Jan. 26-30, 1948.)

12a-35. Some Engineering Aspects of Quality Control. A. G. Dalton. *Mechanical Engineering,* v. 70, March 1948, p. 205-207, 225.

Presented at Annual meeting, A.S.M.E., Atlantic City, Dec. 1-5, 1947.

12a-36. Development of A.S.A. Standard for Slotted and Recessed Screw Heads B18.6-1947. F. P. Tisch. *Fasteners,* v. 4, no. 4, 1948, p. 10-12.

Report by Chairman of Subcommittee no. 3 of the Sectional Committee on the Standardization of Bolt, Nut and Rivet Proportions.

12b—Ferrous

12b-6. General Inspection. *B.S.F.A. Bulletin,* v. 1, Jan. 1948, p. 1-7.

Recommended ferrous foundry inspection procedures.

12b-7. A.I.S.I. Standard Alloy Steel Compositions; Openhearth and Electric Furnace Alloy Steels (Bars, Billets, Blooms and Slabs). *Metal Progress,* v. 53, Feb. 1948, p. 240B.

List includes Oct. 1947 revisions.

12b-8. Report of Activities of A.I.S.E. Standardization Committee—1947. Frank W. Cramer. *Iron and Steel Engineer,* v. 25, Feb. 1948, p. 60-62.

(Presented at A.I.S.E. annual convention, Pittsburgh, Sept. 23, 24, 1947.)

12b-9. Report of Committee on Sling and Crane Chain Standards. J. B. Mitchell and J. F. Byers. *Iron and Steel Engineer,* v. 25, Feb. 1948, p. 63, 66-68; discussion, p. 63.

Includes A.I.S.E. Standard No. 4.

12b-10. A.I.S.E. Standard No. 5; Standards for Wiring Diagrams. *Iron and Steel Engineer,* v. 25, Feb. 1948, p. 69-70.

Diagrams for all controls designed especially for steel-mill service.

12b-11. Mill Motor Brake Standardization. *Iron and Steel Engineer,* v. 25, Feb. 1948, p. 71-75; discussion, p. 75-77.

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"Heavy Forgings" Is Foley's Subject at Two Recent Meetings

At Dayton on Feb. 11 National President Francis B. Foley (Left) Is Seated Next to Chapter Chairman Stewart DePoy (Reported by H. J. Reindl)

"Heavy Forgings" Was Also Mr. Foley's Subject at Peoria. His partner here is J. W. Bridwell of Caterpillar Tractor Co. (Reported by A. G. Phillips)

Puzzling Phenomena of Ferromagnetism Clarified for Metallurgist by L. C. Hicks

Reported by Melvin R. Meyerson
National Bureau of Standards

Ferromagnetism was described from the standpoint of the metallurgist and many of the puzzling phenomena associated with the subject were clarified by Laurence C. Hicks, assistant director of research, Allegheny Ludlum Steel Corp., who spoke on "Magnetic Materials" before the Washington Chapter A.S.M.

Dr. Hicks's talk included verbal definition and pictorial representation of magnetic terms such as permeability, magnetizing force, flux density saturation, hysteresis, and eddy currents. He showed the types of magnetization curves in use and the characteristic data that can be obtained from each type.

Magnetic core materials are of five basic types as follows:

1. High purity iron
2. Alloys of iron containing from 0.5 to 5.0% of silicon (armature, dynamo, and transformer grades)
3. Alloys of iron and nickel (4750, Permalloy)
4. Alloys of iron and nickel modified by addition of small quantities of silicon, molybdenum, copper, or chromium (Monimax, Sinimax, Mumetal, molybdenum Permalloy)
5. Alloys of iron and cobalt with and without a third element such as vanadium (Permendur)

Each of these alloy groups has its particular saturation, permeability, resistivity, and core-loss properties.

These materials are all magnetically soft and usually have low mechanical properties. The permanent magnet class of materials is magnetically hard and generally has higher mechanical properties than the magnetic core material. The distinction between the two types is governed by the effect of a halt in the inducing current on the induced magnetic field. In the soft-core materials the magnetic field collapses and very slight magnetism remains, while in the permanent magnet alloys high residual magnetism remains.

Types of permanent magnet material in use today include:

1. High-carbon steels with or without small amounts of tungsten or chromium.
2. Complex cobalt-molybdenum-tungsten alloys (Remalloy)
3. Aluminum-nickel-cobalt-iron alloys generally known as the Alnicos.
4. Copper-nickel-cobalt alloys (Cunico, Cunife)
5. Silver-manganese-aluminum alloys (Silmanal)
6. Cobalt-vanadium-iron alloys (Vicalloy)

The speaker concluded by showing the remarkable improvements gained in magnetic alloys by preferred orientation of the crystals. By controlled cold reduction and annealing, silicon-iron alloys can be produced exhibiting remarkably low core loss and high permeability when magnetized in the direction of rolling. The degree of orientation can be judged by the fact that the core loss normal to the direction of rolling may be two to three times that measured parallel to the rolling direction.

Silliman Takes New Job

Warren A. Silliman, chairman of the Cleveland Chapter A.S.M., has resigned as chief metallurgist of the Cletrac Plant of the Oliver Iron Corp., and is now employed as metallurgist of the American Metal Treating Co., Cleveland.

Modern Foundry Layout Impresses Visitors to Brake Shoe Bearings Div.

Reported by Norman Edinger
Raymond Mfg. Co.

A streamlined layout, cleanliness and mechanized batteries of work stations impressed a group of approximately 125 members and guests of the Northwestern Pennsylvania Chapter who visited the Meadville, Pa., plant of the National Bearings Division of American Brake Shoe Co. on Feb. 26.

In the foundry, batteries of convection-type core ovens, jolt rollover machines, squeezers, conveyers, dust-free mechanical shakeouts, hydroblast equipment and other labor-saving devices, with two enormous overhead cranes to service the entire area, were a revelation in foundry practice. The melting zone, with rows of pallet-type bins and completely mechanized charging floor, showed ample evidence of careful planning and well thought out arrangement.

The machine shop exhibited one of the finest assemblies of precision machine tools in this part of the country. Intricate babbitt-lining machines that are almost human in their sequences of operations, highly precise boring machines, vertical boring mills with 24 to 84-in. capacity, radial drills from 4 to 8 ft., lathes—both turret and engine type—with complex fixtures, all contribute to turning out astonishingly accurate work.

The material handling problem has been most efficiently solved by use of conveyers, both live and gravity, intricate monorail systems, electric trucks, mill booms, platform trucks with scoops for sand handling, pallets and steel bins, all integrated to form a most efficient and modern industrial layout.

Three short papers as follows: Effect of Proposed New Aisle Mill Motors on Motor Brake Design, by A. H. Myles; Aisle Mill Motors and Brake Standardization, by John A. Cortelli; and Effect of WR^2 on Brake Design, by A. E. Lillquist. (Presented at A.I.S.E. Annual Convention, Pittsburgh, Sept. 23, 1947.)

12b-12. Contribucao Para Uma Especificacao de Gusa. (Specifications for Cast Iron.) Yves Mathieu, Baldassare Mattana, and Grovanne B. Giuliani. *Boletim da Associacao Brasileira de Metais,* v. 3, Oct. 1947, p. 719-733; discussion, p. 733-749.

The various cast-iron compositions are tabulated, charted, and discussed at length by a group of engineers.

12b-13. The Value of High Voltage X-Ray in Automotive Parts. E. H. Grimm. *Non-Destructive Testing,* v. 6, Fall 1947, p. 20-21.

Use by Auto Specialties Mfg. Co., St. Joseph, Mich., in production of cast-steel crankshafts and malleable-iron castings as well as hydraulic and mechanical jacks.

12b-14. Field Inspection of Drill Strings; Second Progress Report on Nondestructive Testing of Drill Pipe. L. R. Jackson, H. M. Banta, R. C. McMaster, and T. P. Nordin. *Drilling Contractor,* v. 4, Feb. 15, 1948, p. 52-57.

During a six-week field trip in the Permian Basin, West Texas oil fields, Battelle engineers observed field inspection of drill strings and collected joints containing defects, for use in developing nondestructive test methods. Observations on present field-inspection practices, and examples of defects observed in the field.

12b-15. A Visual Aid for Inside Inspection of Drill Pipe; Third Progress Report on Nondestructive Testing of Drill Pipe. L. R. Jackson, H. M. Banta, R. C. McMaster and T. P. Nordin. *Drilling Contractor,* v. 4, Feb. 15, 1948, p. 58-60.

A simple optical device which consists essentially of a sectional pole carrying a light source and a 45° conical mirror. Such devices may be constructed quickly and at low cost, are light-weight and portable, and provide clear images of the defects. They provide means for inside inspection intermediate between crude visual inspection with a spotlight, and detailed inspection with an expensive borescope.

12b-16. X-Ray Gaging of Strip Steel With Phototubes. *Electrical Manufacturing,* v. 41, March 1948, p. 105-107, 192, 194, 196.

Two new electronic instruments are analyzed, one designed primarily for application to hot-roll mills, the other to cold-roll stands.

12b-17. Quality Control Helps Make Better Rivets. Herbert Schneider. *Fasteners,* v. 4, no. 4, 1948, p. 4-7.

Effects of cold drawing and of variations in annealing times and temperatures on physical properties. These effects are illustrated by photomicrographs, and manufacturing procedures are briefly described, including pickling.

12b-18. A New Machine Bolt Specification. A. D. Morris. *Fasteners,* v. 4, no. 4, 1948, p. 13-15.

A.S.T.M. tentative specification for steel machine bolts and nuts and top bolts.

12b-19. How to Cut Unnecessary Costs. I. Injuries in Ground Surfaces. L. P. Tarasov. *Steel,* v. 122, March 22, 1948, p. 71-74, 76, 79.

How to detect and recognize injuries due to cracks, stresses, or burns resulting from grinding of hard steel, including toolsteels, carburized steels, and cemented carbides; how to decide whether or not the trouble is serious enough to affect useful life of the part; and how to track down and eliminate the principal cause or causes of defects.

12c—Nonferrous

12c-3. A Commentary on the New British Standard on Definitions of Trade Terms for Some Nonferrous Wrought Products. D. C. G. Lees. *Metal Treatment,* v. 14, Winter 1947-48, p. 199-201.

New standard definitions attempt to reduce confusion in the metal-producing and metalworking industries concerning terms such as "sheet", "wire", "bright rolled finish".

12c-4. How Westinghouse Standardized Single-Point Carbide Tools. J. C. Gumpper and T. Badger. *Machinery,* v. 54, March 1948, p. 162-167.

12d—Light Metals

12d-1. Crack Detection. A. J. Weston. *Metal Industry,* v. 72, Feb. 6, 1948, p. 108.

Use of the chalk test for very fine cracks in light-alloy die castings has not always been satisfactory. Use of Wood's metal impregnation under pressure followed by radiography was also unsatisfactory for very fine cracks on account of high surface tension. Various other types of substances were also unsuccessfully used before an iodized popyseed oil sold under the name "Neo-Hydriol" was found to be the ideal medium.

12d-2. Short Source-Object Distance Exposure Techniques in Spot Weld Radiography. R. C. McMaster, F. C. Lindvall, and J. W. Smith. *Non-Destructive Testing,* v. 6, Fall 1947, p. 31-37.

Gives practical instructions for use of S.O.D. exposure techniques which reduce spot weld X-ray exposure times to 1 to 2 sec. 12 ref. (Presented at 6th annual convention, American Industrial Radium and X-ray Society, Atlantic City, Nov. 20-22, 1946.)

For additional annotations indexed in other sections, see: 3b-35; 14a-28-29-30; 22b-83; 24a-50; 26c-7.

13 TEMPERATURE MEASUREMENT and CONTROL

13-13. Instruments, Furnace Control and Heat Treatment. *Metal Treatment,* v. 14, Winter 1947-48, p. 197-198.

13-14. Items of Controllability in the Openhearth Combustion Process. A. J. Fisher. *Yearbook of the American Iron and Steel Institute,* 1947, p. 201-232; discussion, p. 232-233.

Various types of control instruments and systems used at Sparrows Point, Md., plant of Bethlehem Steel. (Presented at A.I.S.I. meeting, New York, May 21-22, 1947.)

13-15. Temperature Control of Electrically Heated Gas Carburizing Furnaces. *Instrumentation,* v. 3, 1st Quarter, 1948, p. 21.

13-16. Determination of the Temperature in the Region Just Below the Crown of Coking Furnaces. (In Russian.) B. I. Kustov, A. I. Voloshin, and I. A. Kopeliovich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, 1947, p. 1459-1462.

These temperatures are important for control of coking furnaces. Investigation showed that retained heat radiated from the crown causes a considerable lag in the indications of thermocouples located just under the crown. Recommends placing the couples further down between the crown and the top of the charge.

13-17. Measurement of the Temperature of Railway Brake Blocks. R. C. Parker and P. R. Marshall. *Engineering,* v. 165, Jan. 2, 1948, p. 21-22; Jan. 9, 1948, p. 45-48. Condensed from paper presented to Institution of Mechanical Engineers, London, Nov. 7, 1947.

Various methods which have been used to measure the surface temperatures of bearing surfaces. The method used is based on measurement of emitted radiation. Results obtained for a "black body", for oxidized steel, and for bright steel. Test apparatus and results of an investigation of the effects of various factors.

13-18. The Embrittlement of Chromel and Alumel Thermocouple Wires. *Wire Industry,* v. 15, Feb. 1948, p. 113. Based on paper by W. I. Pumphrey, *Journal of the Iron and Steel Institute,* v. 157, Dec. 1947, p. 513-514.

Previously abstracted from original paper. See item 13-6, March 1948 issue of Metals Review.

13-19. Surface Temperature Measurement. M. Diana Hedgcock and R. Mayorcas. *Journal of the Iron and Steel Institute,* v. 158, Feb. 1948, p. 236-247.

Methods of measuring surface temperature which have particular reference to the requirements of the steel industry. Theoretical considerations; descriptions and evaluations of the various methods including several recent developments. 15 ref.

For additional annotations indexed in other sections, see: 16a-16-18.

14 FOUNDRY PRACTICE

14a—General

14a-28. Malleable Foundry Finishing and Inspection. T. Earl Poulson. *American Foundrymen's Assoc., Pre-Print No.* 47-8, 1947, 8 pages.

14a-29. A Study of the Precision of Sand Test Data. Robert E. Morey and Carl G. Ackerling. *American Foundrymen's Assoc., Preprint No.* 47-18, 1947, 7 pages.

Uses statistical methods to examine reproducibility or precision of

(Turn to page 32)

Isothermal Quench on Tonnage Basis In 40-Ft. Salt Tanks Now Commonplace

Reported by John Watson
Metallurgist, Link-Belt Co.

In many applications isothermal quenching has now been made a tonnage process, Harold J. Babcock, of Ajax Electric Co., Inc., told the members of the Indianapolis Chapter A.S.M. at the February meeting. Tanks of molten salt 40 ft. long or 20 ft. deep are now commonplace, he said, speaking on "Commercial Applications of the Isothermal Quench", a subject which he expanded into related fields of practical heat treating operations.

Cooling Power Controversy

The speaker presented evidence from German literature and his own experiments on the controversial subject of cooling power of molten salt baths. These data showed that a salt bath at 450° F. has the same cooling rate as water at room temperature in the pertinent 1300 to 900° F. range. Hardness attained in the salt bath quench at this temperature is not as high as it is in water due to length of time in cooling the former in air from Ms to Mf. This permits martensite formed just below the Ms temperature to be tempered before cooling to room temperature. Finishing the cooling cycle in water after equalizing in salt at the martempering temperature is not recommended, if the primary objectives of non-distortion and strain-free structure are to be realized.

Molten salt has a greater cooling power than lead in the range of patenting or cyclic annealing. However, as the temperature of a salt quench bath is increased, the H-value goes down. It is therefore necessary to increase the alloy content of steels to be austempered over that required by conventional quenches if sections are critical.

Many practical heat treating tips were disclosed in the course of the talk. Among these the following are outstanding:

1. Forgings may be heat treated by cyclic annealing direct from the forging temperature, using an isothermal salt bath quench followed by a flash water quench which descales the forgings.
2. Austenizing cast iron at different temperatures causes a wide divergence in its time-temperature-transformation curve.
3. Chilled gray iron may be quick annealed to a machinable condition by preheating, then heating to 2100° F. in a salt bath, then isothermally transforming in a salt bath at 1100° F. for 10 min.
4. A bainitic treatment may be used to improve the properties of high speed steel.
5. A fast cool from carburizing temperature prevents carbide precipitation.

In conclusion Mr. Babcock stated that a salt bath quench must be properly designed as a heat exchanger and have a high degree of agitation adjacent to the surface being quenched to be effective. Properly directed agitation is necessary in martempering or austempering as well as in conventional quenching if maximum development of physical properties is to be expected.

Standard Tube Occupies New Detroit Plant

In less than ten months after selecting a site, Standard Tube Co. formally moved into a completely new manufacturing building and office at 24400 Plymouth Rd., Detroit. The company specializes in production of electric resistance welded tubing in carbon, low-alloy high-tensile, and stainless steels.

Main production bays at the new plant are 81 x 380 ft. in size with area of better than 30,000 sq. ft. Three are provided at present, with property available for half a dozen more. Then entire plant has floor area of about 146,000 sq. ft.

tests used in the evaluation of foundry molding sands. Shewhart's method for relatively small samples was found particularly suitable for this purpose.

14a-30. New Tentative Standards for Grading and Fineness of Sands. R. E. Morey. *American Foundrymen's Assoc., Preprint No.* 47-29, 1947, 6 pages.

How fineness of foundry sands may be determined for particles too small to be screened by means of a hydrometer. The hydrometer test data combined with information obtained by sieving the coarser material gives complete information on particle-size distribution. When plotted on semi-log paper, these data form a smooth curve which permits exact comparisons among mold materials. A cumulative curve also may be drawn from data obtained using screens only. In either case, size distribution can be determined by inspection, and an index to grain distribution can be found by means of a simple calculation.

14a-31. Feeding of Metal Castings. A. F. Faber, Jr., and D. T. Doll. *American Foundrymen's Assoc., Preprint No.* 47-35, 1947, 14 pages.

Derivation of a general equation for gating castings and experimental evidence in support of same.

14a-32. Density of Molding Sand. H. W. Dietert, H. H. Fairfield, and E. J. Hasty. *American Foundrymen's Assoc., Preprint No.* 47-39, 1947, 15 pages.

Discusses density of molding sand and its chilling effect upon liquid metal. Variations of density caused by different ramming techniques and by use of different additives. Relationships of density to mold hardness and to grain size and distribution, and clay and moisture content.

14a-33. Evaluation of Core Knockout. *American Foundrymen's Assoc., Preprint No.* 47-43, 1947, 13 pages.

Results of a series of foundry and laboratory tests to study the relationship between behavior of cores during shakeout and laboratory tests at elevated temperatures.

14a-34. Heat Transfer. *American Foundrymen's Assoc., Preprint No.* 47-55, 1947, 23 pages.

Contains a report of the committee chairman and several other papers which are being abstracted separately.

14a-35. Influence of Properties on Solidification of Metals. Victor Paschkis. *American Foundrymen's Assoc., Preprint No.* 47-55, 1947, p. 2-9.

Results of tests to determine the relative importance of all thermal properties. Uses the electric analogy method.

14a-36. Thermal Conductivities of Three Sands. C. F. Lucks, O. L. Linebrink, and K. L. Johnson. *American Foundrymen's Assoc., Preprint No.* 47-55, 1947, p. 10-13.

Method and apparatus used in determining the above over a temperature range of 750 to 2250° F.

14a-37. Molding Boxes. John B. Morton. *Foundry Trade Journal,* v. 84, Jan. 29, 1948, p. 97-102.

Fabrication of large cast-iron boxes from standardized sections.

14a-38. Synthetic Resin Binders; Application in the Foundry Industry. Howard C. Frisbie. *American Foundryman,* v. 13, Feb. 1948, p. 37-39.

Types; applications, advantages, and procedures for use.

14a-39. Malleable Sand Control. David Tamor. *American Foundryman,* v. 13, Feb. 1948, p. 50-51.

A general discussion.

14a-40. Modern Foundry Theory for the Patternmaker. E. J. McAfee and R. G. Wagner. *American Foundryman,* v. 13, Feb. 1948, p. 52-56.

Excerpts from "The Patternmaker's Manual", Training Office, Puget Sound Naval Shipyard.

14a-41. Industrial Vacuum Melting. Kenneth Fox, R. A. Stauffer, and W. O. DiPietro. *Iron Age,* v. 161, Feb. 19, 1948, p. 64-70.

Various design features and the influence of these factors on production, maintenance, and measurement of vacuums ranging from 1 to 25 microns. (To be continued.)

14a-42. Multiple Molding Can Increase Production. William G. Gude. *Foundry,* v. 76, March 1948, p. 66-69, 198, 200.

The multiple-molding method developed at Wisconsin Appleton Co. and its advantages and limitations.

14a-43. Investment Casting. Edwin Laird Cady. *Scientific American,* v. 178, March 1948, p. 119-121.

Method and its applications.

14a-44. Recurrent Wasters. Shedrick. *Iron and Steel,* v. 21, Feb. 1948, p. 38.

Some reasons for difficulty in ensuring correct practice in repeat orders for a given casting job.

14a-45. New Moldmaking Practice—for Foundries. *Plastics* (London), v. 12, Feb. 1948, p. 74-75. Based on F.I.A.T. Final Report 1168.

New process developed by Croning and Co., Hamburg, Germany. A plastic bonding agent is used to bind the sand grains together for unusual surface smoothness, high gas permeability, and dimensional stability. The process is especially suitable for the production of steel castings with very thin sections.

14a-46. Design and Production Technique. VI—Principles Involved in Casting. A. J. Schroeder. *Aircraft Engineering,* v. 20, Feb. 1948, p. 57-60.

Principles are illustrated by an extensive series of diagrams.

14a-47. The Metallurgist in the Foundry. W. H. Salmon. *Foundry Trade Journal.* v. 84, Feb. 5, 1948, p. 121-128, 132.

Cooperation between technician and practical man.

14a-48. Notes on Pattern Construction. R. J. Hart. *Foundry Trade Journal,* v. 84, Feb. 12, 1948, p. 145-147.

How use of block cores permits greater precision in molding. (Presented at symposium organized by East Anglian Section of London Branch of Institute of British Foundrymen.)

14a-49. The "C" Process. E. Piwowarsky. *Foundry Trade Journal,* v. 84, Feb. 19, 1948, p. 181.

New casting process developed in Germany and described in Dec. 4, 1947 issue. (See item 14a-9.) Its pros and cons. At present it is considered primarily as suitable for the production of special shapes of not too great a cross-section. It gives solid and accurately finished castings which in most cases do not require any further surface machining. Phenolic resin boiled molds and cores are used.

14a-50. Permanent Molds. J. B. McIntyre. *Metal Industry,* v. 72, Feb. 20, 1948, p. 143-145.

Materials now in use for permanent-mold manufacture, together with their attendant disadvantages; optimum requirements for refractory molds; reviews the literature.

14a-51. Automatic Mechanical Ladling. E. F. Ross. *Steel,* v. 122, March 15, 1948, p. 108, 111.

Use in die casting eliminates manual ladle-to-injection-chamber transfers. Castings are produced at rate of 1 to 2 per min.

14b—Ferrous

14b-26. Spendlikové Pory, Jejich Vznik a Pripadné Odstranení (Pinholes, Their Formation and Apparent Elimination.) Jan Kraus. *Hutnicke Listy,* (Metallurgical Topics), v. 2, Dec. 1947, p. 129-138.

The effect of pouring temperature and moisture content of the molding sand or bentonite on pinhole formation in ferrous castings. Presents theoretical discussions based on the interaction of Al, O_2, Si, and H_2; and also on the formation of CO by reaction of Fe and C, both possible mechanisms of pinhole formation. The latter is preferred by the author. Effects of reducing or oxidizing conditions in the mold cavity during pouring and the effect of diffusion of gases.

14b-27. Temperature Distribution in Metal Molds. M. C. Udy and H. D. McIntire. *American Foundrymen's Assoc., Preprint No.* 47-6, 1947, 12 pages.

Pertinent data obtained from an investigation of several variables affecting the above. Mold thickness, mold coating thickness, casting thickness, cooling media, cooling-water rate, mold heat conductivity, and finned vs. plain plates were studied by measuring the temperature distribution in a test plate at intervals following the pouring of a casting on that plate.

14b-28. Silicon Carbide Inoculation of Gray Cast Iron. E. A. Loria, H. D. Shephard, and A. P. Thompson, *American Foundrymen's Assoc., Preprint No.* 47-49, 1947, 8 pages.

Effect of above on the normal chilling tendencies of unalloyed and alloyed cast iron.

14b-29. Freezing Rate of White Cast Iron in Dry Sand Molds. H. A. Schwartz. *American Foundrymen's Assoc., Preprint No.* 47-55, 1947, p. 14-15.

14b-30. Studies on Solidification of Castings. Victor Paschkis. *American Foundrymen's Assoc., Preprint No.* 47-55, 1947, p. 22-23.

14b-31. Pressure Feeding of Steel Castings. W. T. W. Shute. *American Foundryman,* v. 13, Feb. 1948, p. 60-62.

Previous methods, and new method developed by Jazwinski and Finch in England, by which pressures up to 350 psi. are obtained by use of pellets of an exothermic, gas-evolving compound. Methods for use of the method, especially for proper riser design.

14b-32. Current Melting Problems in the Gray Iron Foundry. Donald J. Reese. *Foundry,* v. 76, March 1948, p. 78-79, 184, 186, 188.

A practical discussion of various technical and economic problems, mainly dealing with use of substitute raw materials made necessary by shortages.

14b-33. Steel Foundry Uses Wood Plate on Core Blower. Pat Dwyer. *Foundry,* v. 76, March 1948, p. 82-84, 224, 226, 228, 230, 232, 234.

Substitution of a plywood blowplate for the usual metal plate at a jobbing foundry.

14b-34. Conversion of Cylinder Cover From Floor to Machine Molding. O. Smith. *Foundry Trade Journal,* v. 84, Feb. 19, 1948, p. 177-179.

Methods used to mechanize production of cast iron part.

14b-35. Cupola Operation With Heated Blast. S. W. Healy. *American Foundryman,* v. 13, March 1948, p. 44-45.

Advantages.

14c—Nonferrous

14c-14. Die Casting With City Gas. Arthur Q Smith. *Industrial Gas,* v. 26,

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Arsenal Speakers Outline Developments in National Defense

Reported by Leo P. Tarasov
Research Engineer, Norton Co.

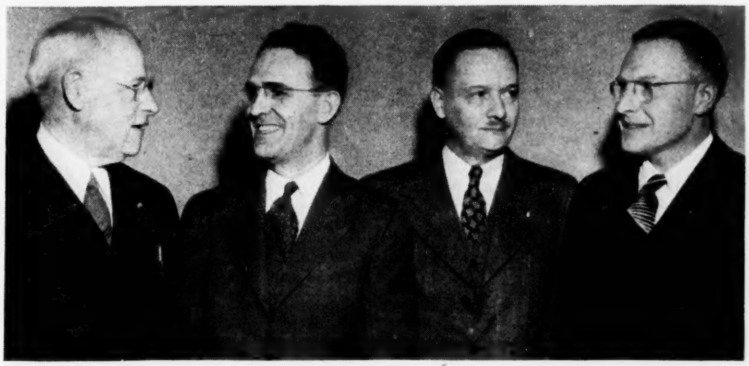
"Metals Research and National Development in National Defense" was the subject of the Worcester Chapter meeting on Feb. 10, with three speakers contributing to an outstanding program. Lt. Col. Warren Snow (Reserve) opened the program by outlining briefly the functions of the 413th Ordnance Base Armament Maintenance Battalion being organized in Worcester on a reserve basis. Army Ordnance movies were then shown depicting various types of guns in action.

H. H. Lester of Watertown Arsenal then spoke on the importance to this country of various types of scientific activity. One of the most important factors in maintaining our position as a first-rate power is our scientific strength, Dr. Lester pointed out. Progress is possible only if we continue to acquire new knowledge, which can then be utilized in some practical manner. Once our store of accumulated information is used up, we could no longer develop new devices, and the United States would be surpassed in strength by other nations that continue to develop new ideas and information.

Until the last war, we depended on other countries for this fundamental information, Dr. Lester continued. Our industrial leadership was based upon our outstanding ability to apply such information. With the countries of Western Europe in their present condition, we must now depend upon ourselves for fundamental new ideas; Russia, he said, can be expected to keep anything really important to itself.

Thus our industrial progress depends upon both academic and basic research. The first, according to the speaker, involves developing knowledge for its own sake, while the second is motivated by a utilitarian objective. Either type of information can be obtained with relatively few people and correspondingly low cost; it is the practical utilization of such information that requires a large amount of manpower and financial backing. (The development and manufacture of the atomic bomb was an example of this, although on an exaggerated scale because of wartime conditions.) Luckily our country is very strong on utilization of knowledge, but we must remedy our past weakness in obtaining fundamental information.

Dr. Lester closed with a few remarks on the several functions of Watertown Arsenal in conducting investigations on metals. All equipment, military or otherwise, is limited in its design and use by the properties of the materials of which it is constructed. The Arsenal's job is to develop the utmost in the metals that will be used for military purposes.



From Left—H. H. Lester and D. L. Martin, Both of Watertown Arsenal, Were Principal Speakers at the February Meeting of the Worcester Chapter A.S.M. Herbert L. Phillips is also a member of the Arsenal staff, and Allen D. Wassall acted as technical chairman for the meeting

J. L. Martin, also of Watertown Arsenal, then took the floor and described in detail the problems that had to be overcome in the centrifugal casting of thick-walled tubes such as are used for gun barrels. Various types of defects were illustrated by slides. Important operating factors in successful casting are the rate at which the steel is permitted to flow into the rapidly rotating mold, and the speed of rotation, which may be higher than 1000 r.p.m. In tapered molds the molten steel apparently moves into the rotating mold in successive waves, and if conditions are not right, cold shuts may result. If too much metal gets into the mold before the solidified shell is strong enough to resist the pressure, it is likely to crack. These and other defects were overcome in a 15-year period before the war, according to Dr. Martin, so that when it became necessary to cast gun barrels in tremendous quantities, it was possible to do so.

Ryerson Completes Bay Plant

Joseph T. Ryerson & Son, Inc., nationally known steel distributor, has completed construction of a new steel service plant in the San Francisco Bay area. The plant is in the town of Emeryville, and is the second Ryerson plant in California and the 13th in the company's nation-wide group.

Wayne D. Dukette, formerly manager of the Ryerson steel service plant in Cincinnati, Ohio, is manager of the new San Francisco plant. Ray C. Page, formerly an assistant sales manager of the company's plant in Chicago, is sales manager.

Gray Cast Iron as Engineering Material

Reported by H. J. Reindl
Metallurgist, Inland Mfg. Div., G. M. C.

An excellent description of gray cast iron and its practical applications as an engineering material was presented by William A. Schneble, vice-president, Advance Foundry, Dayton, Ohio, at the Jan. 14th meeting of the Dayton Chapter, A.S.M.

Graphite flake formation, distribution and size determine to a large extent the properties and machinability of gray cast iron, Dr. Schneble said. He showed slides to illustrate the various types of graphite formation and their effects upon the physical properties of the iron. Maximum physical properties are obtained with a uniform distribution and a random orientation of the graphite flakes.

So called "hard spots" or chills are usually associated with undissolved carbides, which are extremely hard. These carbides cannot be removed by subsequent heat treatments without affecting the other properties of the cast iron.

Gray cast iron will withstand higher compressive loads, resist corrosion to a greater extent and is less notch-sensitive than steel. However, it has a lower tensile strength, elongation and reduction of area than steel.

Dr. Schneble conducted a lengthy discussion which brought to light many gray iron problems encountered by those present.

Feb. 1948, p. 10, 30.

Procedures and equipment.

14c-15. Modern Die Casting Practice. R. J. Reel. *Steel,* v. 122, Feb. 9, 1948, p. 81-84, 86, 88; Feb. 16, 1948, p. 90-92, 94; Feb. 23, 1948, p. 92-94, 96, 98; March 1, 1948, p. 90-92, 114, 116.

Advantages of die casting nonferrous metals and alloys and melting and metal-handling methods. Various types of casting machines and processes, die construction, and materials. Problems of cooling, grating, and air venting. Die materials and flash removal; application trends.

14c-16. Bronze Founding; A Review of Some Recent Developments. Frank Hudson. *Foundry,* v. 76, March 1948, p. 86-89, 172, 174, 176, 178-179, 182-184. Reprinted from *Metallurgia,* v. 36, Oct. 1947, p. 303-308.

Previously abstracted from above source. See item 14-342, R. M. L., v. 4, 1947.

14c-17. Stampings From Molten Nonferrous Metals. N. A. Sokolov. *Engineers' Digest,* v. 5, Feb. 1948, p. 77-79. Translated and condensed from *Vestnik Inzhenerov i Tehnikov* (News of Engineering and Technology), 1946, p. 301-306.

Process described and diagrammed differs from ordinary die casting or pressure casting in that the pressure is developed in and by the die itself, and not in an external pressure chamber. This eliminates the principal defect of die casting; i.e., the porosity which results from the flow of metal in a high-velocity stream from the pressure chamber into the die.

14c-18. Germans Cast Billets by Continuous Methods. *Aluminum Bulletin,* v. 1, March 1948, p. 3. Based on "Metallurgical Practices in Germany—the Fields of Nonferrous Melting and Coating", PB-81641, Office of Technical Services, U. S. Dept. of Commerce.

Two methods for the continuous casting of round and sheet billets of nonferrous metals used for rolling and extrusion operations.

14c-19. Economics of Die Construction. E. N. Field. *Machinery* (London), v. 72, Feb. 26, 1948, p. 283-287.

Use of interchangeable collets in die-casting dies.

14c-20. Hydropress Cold-Chamber Die-Casting Machine Demonstrated at International Detrola Corp. *Modern Industrial Press,* v. 10, March 1948, p. 6, 8, 36, 54.

One of the largest cold-chamber die-casting machines in existence.

14c-21. Flash Removal as It Affects Die-Casting Design. Herbert Chase. *Die Castings,* v. 6, March 1948, p. 40-44.

Factors involved in die parting and methods used for flash removal with regard to cutting costs and improving appearance by proper design. Illustrated.

14d—Light Metals

14d-14. Some Causes of Pinholes in Magnesium Alloy Castings. H. H. Fairfield and A. E. Murton. *American Foundrymen's Assoc., Preprint* No. 47-44, 1947, 10 pages.

Different types of sand, metal, and pouring methods were used in these experiments. A flat plate was chosen as a test casting, because the pinhole defect is said to be most prevalent on large flat surfaces. About 700 castings were made. The plates were radiographed and the number of circular defects determined.

14d-15. Solidification Rates of Aluminum in Dry Sand Molds. H. Y. Hunsicker. *American Foundrymen's Assoc., Preprint* No. 47-55, 1947, p. 16-22.

Discusses test results in an attempt to correlate data obtained on metal solidification rates by experimental methods in the foundry with similar data determined by a less expensive electrical method.

14d-16. Recent Improvements in Magnesium Alloy Founding. J. W. Meier and H. Livingstone. *Canadian Mining and Metallurgical Bulletin,* v. 41, Feb. 1948, p. 69-75; discussion, p. 75-77.

14d-17. Continuous Casting; German Plant and Practice. *Metal Industry,* v. 72, Feb. 6, 1948, p. 109-110.

Practically the entire German output of light alloys for extrusion was produced by the continuous-casting process. Machines and methods used by the various plants as well as an ingenious method of billet separation using a layer of molten salt.

14d-18. Die Casting Magnesium. Herbert Chase. *Iron Age,* v. 161, Feb. 26, 1948, p. 68-72.

Operations in the production of a large variety of magnesium die castings. Notes on injection techniques and die design.

14d-19. Aluminum Alloy Castings. Floyd A. Lewis. *Foundry,* v. 76, March 1948, p. 90-93, 232, 234, 236.

Melting operations are discussed in fourth of a series. (Based on a survey sponsored by the Foundry Division of the Aluminum Assoc.)

14d-20. Canada's Largest Aluminum Alloy Foundry Is 100% Mechanized. *Canadian Metals & Metallurgical Industries,* v. 11, Feb. 1948, p. 14-17, 40-41.

Etobicoke Works of Aluminum Co. of Canada, which was built during the war.

14d-21. Melting Aluminum. *Metal Industry,* v. 72, Feb. 20, 1948, p. 147-150. Condensed from recent B.I.O.S. report.

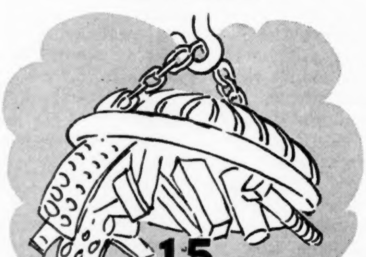
German plant and practice in all-electric foundries.

14d-22. Aluminum Alloy Castings. Floyd A. Lewis. *Materials & Methods,* v. 27, March 1948, p. 89-104.

The various alloys, advantages and disadvantages of the different casting methods and design limitations; finishing, testing, inspection, and processing. 10 ref.

For additional annotations indexed in other sections, see:

2b-46; 4b-9-14; 4d-5; 12a-22; 12b-6; 15c-2; 16a-20; 16b-20; 21a-43; 21b-21; 23d-35; 24d-8; 25b-35; 27a-40; 27d-5.



15 SCRAP and BYPRODUCT UTILIZATION

15a—General

15a-3. Scrap Metals. Charles White Merrill, Herbert L. Cullen, and Norwood B. Melcher. *Mining Congress Journal,* v. 34, Feb. 1948, p. 119-121.

Economic trends.

15a-4. Efficient Methods Employed in Scrap Reclamation. *Modern Industrial Press,* v. 10, March 1948, p. 38, 40, 51.

Methods and equipment used in scrap handling and salvage by Wilkoff Co., Youngstown, Ohio.

15b—Ferrous

15b-8. Simple Tools Repair Pedestal Cracks. A. R. Eastcott. *Power,* v. 92, March 1948, p. 83.

When a large steam turbine's bearing pedestal cracked in two places, welding or machine-shop repair was impracticable. Simple method devised by the plant mechanic.

15b-9. High Hardenability Steel Salvaged by Welding. H. J. Nichols. *American Foundryman,* v. 13, March 1948, p. 46-47.

Method used for a 0.4% C steel containing 1.30 to 1.55% Mn, 0.35 to 0.60% Si, 0.45 to 0.60% Cr, and 0.35 to 0.45% Mo consisted of flame cutting the cracked material away, using the heat so generated as a preheat, and welding the cracked parts by the metallic-arc process.

15c—Nonferrous

15c-1. Tri des Vieux Bronzes et Laitons en Vue de l'Elimination de Pieces Contenant de l'Aluminium. (Sorting of Old Bronzes and Brasses to Eliminate Those Containing Aluminum.) Georges Blanc. *Fonderie,* Nov. 1947, p. 893-894.

Samples are tested with a file and the soft ones discarded since they do not contain aluminum. Drilling will give similar information. The action of various solvents as a means of indicating the approximate percentages of aluminum in the alloys.

15c-2. Secondary Zinc-Base Alloys; Corrosion—Impurities—Production. D. P. Oakley. *Metal Industry,* v. 72, Feb. 6, 1948, p. 113.

The effect of intercrystalline corrosion caused by impurities, the precautions to be taken against such impurities in the manufacture of secondary Zn-base alloys, and working details and temperatures for their use in pressure die casting.

15c-3. Worn and Broken Zinc Die Castings Can Be Repaired by Welding. A. E. Speck. *Materials & Methods,* v. 27, March 1948, p. 72-74.

15d—Light Metals

15d-3. Aluminum Purification; Methods of Removing Hydrogen and Insoluble Particles. *Metal Industry,* v. 72, Feb. 13, 1948, p. 133. Condensed from **Purification of Aluminum and its Alloys,** Yves Dardel, *Metals Technology,* v. 14, Sept. 1947, T. P. 2247.

Previously abstracted from original paper. See item 15-36, R.M.L., v. 4, 1947.

15d-4. Sorting of Aluminum Alloys by Means of the "Steeloscope". (In Russian.) N. S. Sventitskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Dec. 1947, p. 1454-1459.

A method for scrap sorting or qualitative analysis using a form of visual spectroscopy. Lines and bands corresponding to different alloys are illustrated.

For additional annotations indexed in other sections, see:

20b-26; 22b-72-73.

(Turn to page 36)

Five Basic Controlled Atmospheres Cover Most Heat Treatments

Reported by M. P. Fix
A. O. Smith Corp.

"A large percentage of modern heat treating applications require controlled atmospheres in some form or other," said Clarence E. Peck, manager, industrial heating engineering department, Westinghouse Electric Corp., speaking on furnace atmospheres before the February meeting of the Milwaukee Chapter A.S.M. "The type of material being treated and the results expected are the determining factors in choosing the proper type of controlled atmosphere for the job."

A point highly stressed was that a prepared atmosphere is only as good as the furnace it is used in. In other words, a gas which is within specifications, coming from the generator, may be worthless in the furnace because of air infiltration or other causes.

Five basic controlled atmospheres cover practically all heat treating applications in the ferrous and nonferrous fields, namely:

1. Lean and rich, inert, dry, CO_2-free atmospheres. This is an almost universal gas, which can be used for annealing, brazing, sintering and hardening of all types of ferrous and nonferrous metals, except stainless steels.
2. Lean combusted atmospheres used for bright annealing of nonferrous metals.
3. Rich combusted atmospheres used for bright annealing or brazing of ferrous metals where decarburizing is not a factor.
4. Reacted atmospheres low in CO_2 and water vapor, used for bright hardening, sintering and gas carburizing.
5. Atmospheres from ammonia. These include pure H_2 and N_2 for heat treating stainless steels without oxidation and for sintering.

Mr. Peck covered the subject with slides of various types of gas generators and furnaces, together with graphs and charts which proved of great interest, judging by the number of questions asked.

Speaks on Furnace Atmospheres

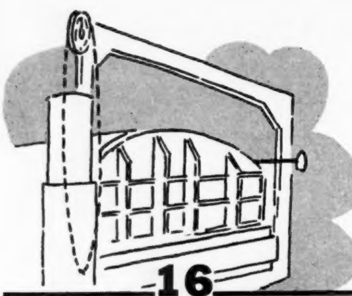
Clarence E. Peck of Westinghouse Electric Corp. (Center) Addressed the Milwaukee Chapter February Meeting. Left is Earl R. Vance, Steel and Tube Division, Timken-Roller Bearing Co., coffee talker; and right is D. R. Mathews, a member of the Milwaukee Chapter Executive Committee (Photo by Walter F. Dickinson)

Gas Turbine Alloys Described

Reported by R. T. Saeger
Bethlehem Steel Co.

Members of the A.S.M. 25-year club were honored at the March meeting of the Lehigh Valley Chapter, held at Hotel Traylor in Allentown, Pa. After several members of the club related incidents of meetings held 25 years ago, an interesting coffee talk was given by Guy Reinert on Pennsylvania Dutch folk lore. Kodachrome slides illustrated Pennsylvania Dutch products of the period between 1830 and 1870.

The main technical speaker of the evening was C. T. Evans, Jr., chief metallurgist of the Elliott Co. His subject was "Heat Resisting Alloys for Gas Turbines". Both he and the Elliott Co. have been pioneers in the development of gas turbines and consequently Mr. Evans is well versed on the subject.



16 FURNACES and HEATING DEVICES

16a—General

16a-14. Resistors for Elevated Temperatures. Without Special Atmospheres. S. H. Parsonage. *Machinery Lloyd* (Overseas Edition), v. 20, Jan. 31, 1948, p. 84-87.

Development of electrical furnace heating elements for temperatures up to 1500° C., including the advantages and limitations of various types. The types developed by the author consist essentially of a graded conductor of Mo, W, C, or graphite contained within a ceramic tube (preferably pure Al_2O_3). Vitreous, metallized seals serve as terminals. Use of molten metals within the ceramic tube was also investigated. Pure tin was best, followed by Sn-Pb. Aluminum was not so good.

16a-15. Immersion Heating: Part III. Maurice J. Dewey, *Industrial Heating,* v. 15, Feb. 1948, p. 232, 234, 236.

Recently discovered uses to which immersion heating may be put, followed by a partial listing of industrial activities in which immersion gas heating could play an important part. (Presented at A.G.A. Industrial Gas School, Columbus, Ohio.)

16a-16. The Design of Industrial Ovens With Special Reference to Safety. Part III. C. A. Litzler. *Industrial Heating,* v. 15, Feb. 1948, p. 283, 286, 288, 290, 292, 299.

Time-delay relay systems, automatic ignition systems, and systems of temperature control. (To be continued.)

16a-17. Induction Heating Applications. N. R. Stansel. *General Electric Review,* v. 51, Feb. 1948, p. 44-50.

At all temperatures, flux distribution, eddy currents, and electrical efficiency are related through mathematical formulas. How they apply to temperatures below the melting point of conductive materials (mainly metals and alloys); to the melting of metals and alloys; and to miscellaneous applications.

16a-18. High Temperatures; Their Production, Measurement and Use. R. S. Hutton and M. Pirani. *Research,* v. 1, Feb. 1948, p. 204-207.

A review. 32 ref.

16a-19. Fundamentals of Combustion. H. C. McRae. *Industrial Heating,* v. 15, Feb. 1948, p. 238, 240, 242, 244

Fundamental considerations in burner design, furnace operation, and the choice of heating units. Discusses the theoretical and practical aspects of combustion, touching upon such subjects as the effect of air in excess, deficient, and ideal amounts; flame temperature; drafty and sealed-in combustion; and the types of furnaces and burners best suited to each. (Presented to Cleveland Chapter, American Ceramic Society.)

16a-20. Industrial Vacuum Melting. Kenneth Fox, R. A. Stauffer, and W. O. DiPietro. *Iron Age,* v. 161, Feb. 26, 1948, p. 78-84.

Materials of construction, types of heat sources, and techniques for casting under vacuum. Also includes a selected bibliography on various aspects of vacuum processing. 29 ref.

16a-21. Etude des Pertes de Chaleur dans les Fours a Marche Discontinue. (Study of Heat Losses in Furnaces Not Operated Continuously.) E. Bonnier. *Verres et Refractaires,* Dec. 1947, p. 22-26.

Ordinary methods of studying heat losses in furnaces operated intermittently proved inadequate. A striking analogy between the laws of heat propagation in a solid and those of electricity propagation in a conductor of uniform resistance and evenly distributed capacity is demonstrated. The model conceived by L. Beuken was thoroughly investigated and is believed to be promising for this investigation.

16a-22. Industrial Heating Furnaces. *Steel Processing,* v. 34, Feb. 1948, p. 90-96.

Various types.

16a-23. National Supply Co.'s New Electric Furnace. Fred Burt. *Western Metals,* v. 6, Feb. 1948, p. 26-29.

Several new design innovations. Type of work done by above company.

16a-24. High-Frequency Heating. *Automobile Engineer,* v. 38, Feb. 1948, p. 69-71.

Developments in standard equipment for a wide range of applications.

16a-25. Melting Metals by Induction Heating. N. R. Stansel. *General Electric Review,* v. 51, March 1948, p. 35-42.

Operational data, electrical features, general construction, and applications for both the coreless-induction and submerged-resistor types.

16b—Ferrous

16b-20. Thermochemical Analysis of Combustion in a Cupola. H. Edward Flanders. *American Foundrymen's Assoc. Preprint* No. 47-50, 1947, 11 pages.

Two equations by which heat of combustion and maximum combustion temperature may be calculated. It is possible, through use of such equations, to estimate immediately the relative effect of preheating of blast air, or of removal of moisture from the blast, on the heat of reaction or the maximum temperature attainable. 14 ref.

16b-21. Operation of a Gas-Fired Enameling Furnace. S. E. A. Ryder. *Gas Times,* v. 54, Jan. 30, 1948, p. 162, 164-166.

Previously abstracted from *Gas Journal,* v. 253, Jan. 14, 1948, p. 113-114, 119. See item 16b-12.

16b-22. Modern Design of Multiple Fuel Steam Unit. A. R. Mumford. *Iron and Steel Engineer,* v. 25, Feb. 1948, p. 88-97; discussion, p. 97-98.

Some of the factors which influence availability. Slag and the control of its deposition is improved by use of cooling screens, improved burner position, and perhaps the relation of the area of the flame envelope to the water-cooled area of the furnace. Illustrated by six recent designs of steam generators for the steel industry. (Presented at A.I.S.E. Annual Convention, Pittsburgh, Sept. 23, 1947.)

16b-23. Hot Blast Stove Gas Burner Gives Soft Mellow Flame. S. P. Kinney. *Blast Furnace and Steel Plant,* v. 36, Feb. 1948, p. 217-219.

Improved type.

16b-24. Electric Heating of Strip Steel for Continuous Processing. *Industrial Heating.* v. 15, Feb. 1948, p. 256, 258, 260.

Reviews papers by A. R. Ryan and F. E. Ackley in which electric furnace heating, resistance heating, and induction heating were discussed. (Presented at recent A.I.S.E. convention, Pittsburgh).

16b-25. Large Car-Type Furnaces Featured at Pearson Industrial Steel Treating Co. Part II. *Industrial Heating,* v. 15, Feb. 1948, p. 310-312, 214, 316.

Concluding article describing the heat treating facilities covers the box-type high-temperature furnaces, the salt-pot furnaces, and the car-type furnaces, together with their quenching and control equipment; and also the finishing and surface-preparation equipment which includes a degreaser, three sand blasting machines, two hardness testers, and a straightening press.

16b-26. Special Induction Heating Setup Tempers Spline Bores of Gears. P. A. Hassell. *Automotive Industries,* v. 98, Feb. 15, 1948, p. 44, 84, 86.

Use of equipment developed by Allis-Chalmers.

16b-27. De Houtskoolhoogoven. (The Charcoal Blast Furnace.) W. H. A. van Alphen de Veer. *Metalen,* v. 2, Feb. 1948, p. 117-120.

Sweden is still producing appreciable quantities of pig-iron in charcoal-blast furnaces. This pig-iron is very pure and is therefore mainly used for the production of high-quality steel. As this type of blast furnace is not so well known in other countries, a short description is presented, including details about the raw materials used, the charging of the furnace, and the special method of heating the air.

16b-28. The Operation of a Gas-Fired Furnace for Vitreous Enameling. S. E. A. Ryder. *Sheet Metal Industries,* v. 25, Feb. 1948, p. 339-344.

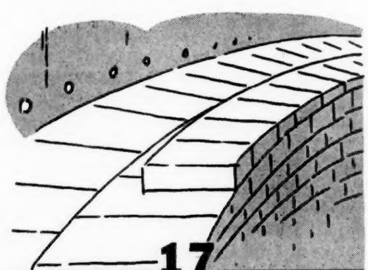
Previously abstracted from *Gas Journal.* See item 16b-12, March 1948 issue of *Metals Review.*

16d—Light Metals

16d-1. Furnaces for Heat Treating Aluminum. Owen Lee Mitchell. *Industrial Heating,* v. 15, Feb. 1948, p. 204-206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 348, 350, 352, 354, 356.

The application of industrial heating in the fabrication of the aluminum alloys in the solid state in the various Reynolds Metals plants.

For additional annotations indexed in other sections, see: 18b-29; 27a-38 27b-20.



17 REFRACTORIES and FURNACE MATERIALS

17-19. Ceramic Materials for Some Special Applications. B. C. Weber. *Headquarters Air Materiel Command,*

(Turn to page 38)

How Transformation and Thermal Stresses Cause Quench Cracking Explained

Reported by W. J. Erichsen
Metallurgist, Westinghouse Electric Corp.

An important function in the heat treatment of toolsteels, but one which is among the least understood, is quenching. "Quench Cracking in Toolsteels", the subject of a talk presented by G. E. Brumbach, metallurgical engineer of Carpenter Steel Co., before the Golden Gate Chapter A.S.M., gave consideration to this vital step in the heat treating operation.

On quenching, the temperature range at which cracking is most prevalent is between the M_s and M_f points when expansion of the steel to a larger volume than the original takes place, Mr. Brumbach pointed out. In addition to transformation stresses, thermal stresses caused by the center of the part cooling more slowly than the outside add to crack susceptibility during quenching.

Internal stresses set up by quenching may be favorable as well as unfavorable. Mr. Brumbach illustrated this point with an etched cross section of a cold heading die which had been hardened by flushing the hole. In this way the wall of the hole was placed in compression and these stresses were favorable when tension stresses were added at the bore in service. Internal compressive stresses, being opposite in direction to applied stress, tend to cancel out each other.

Unfavorable residual stresses were illustrated by a cube having a "vacuum" condition resulting from faster cooling at the corners and edges than at the center. This caused compression of the hot metal at the center of the cube and consequent bulging of the cube sides. When the cube was cold, the bulge remained, causing a "vacuum" effect at the center of the cube. If this cube were a striking die, the service stresses added to internal quenching strains might cause failure at the center of the cube face.

Highest residual stresses occur in water hardening toolsteel and lowest in air hardening toolsteel, Mr. Brumbach demonstrated. Oil hardening steel shows an intermediate amount of internal stress.

The function of grain size in toolsteel and its effect on quench cracking was also discussed. The loss due to cracking during quenching of water hardening toolsteel is greater for coarse-grained steel than fine-grained steel. This was shown by a microstructure of martensite magnified 3000X containing micro cracks.

Soft spots may also result from improper quenching. Etched cross sections of water hardening toolsteels which had been quenched in fresh water showed that shallow hardening toolsteel has a greater tendency to form soft spots than deep hardening steel. Soft spots, however, can be minimized in water hardening toolsteel by quenching in a 10% brine solution. A section of a powder forming die was shown which had been improperly quenched and had worn in service in such a manner as to show the soft spot pattern in the bore.

Summarizing his talk, Mr. Brumbach pointed out methods of minimizing cracking during quenching. Tools made with holes near the edge may have a more uniform quenching rate if the holes are packed tightly with steel wool. Another method involves application of the TTT-curves. Tools may be quenched in a high-temperature bath so that hardening takes place when the center and surface of the part are at the same temperature, thereby eliminating thermal stresses. This type of heat treatment is usually limited to parts of small cross section, and depends on the hardenability of the steel.

Obviously, selection of the proper toolsteel for the job is an important factor in minimizing cracking. A tool with heavy and thin sections adjacent to each other should be made of an oil or air hardening toolsteel rather than a water hardening steel.

An example of proper toolsteel selection was the use of a 5% chromium air hardening steel for a paper punch die containing 1600 holes. This die was hardened without difficulty and with an extremely small size change. Mr. Brumbach also showed numerous slides illustrating the advantages of the low-temperature air hardening steel containing 0.70% C, 2% Mn, 1% Mo, and 1% Cr over the conventional air hardening steels.

Describes New Method Of Metallographic Polishing

Reported by G. F. Kappelt
Assistant Metallurgist, Bell Aircraft Corp.

Development during the war of an activated alumina for metallographic polishing which possesses excellent cutting qualities and at the same time resists "cake" settling was described before the Buffalo Chapter A.S.M. by J. R. Vilella of the United States Steel Corp. The critical factor of Mr. Vilella's process is careful neutralization of the alumina.

Mr. Vilella's general subject was "Metallographic Technique for Steel". The general procedure still used at U. S. Steel is the lead lap method followed by activated alumina. This method of polishing has been used by Mr. Vilella for many years and has been reported in detail in other accounts.

Wright Field, Technical Report No. F-TR-1163-ND, Feb. 1948, 5 pages.
Brief report on electroceramics for high-voltage service, examples of ceramic masses and their properties, and ceramic material for turbine blades.

17-20. A Design for Blast Furnace Hearths. W. S. Unger. *Yearbook of the American Iron and Steel Institute,* 1947, p. 95-112.
Good hearth design and two corollaries: proper selection of materials for construction, and careful and intelligent operation.

17-21. Introduction to Study of the Refractory Oxides. *Industrial Heating,* v. 15, Feb. 1948, p. 300, 302. Condensed from paper by Raymond E. Birch.
The refractoriness of several oxides which might offer possibilities for refractory use, as well as methods of determining this property. (Presented at recent autumn meeting of refractories division, American Ceramic Society.)

17-22. Simple Oxide Porcelains for Jet Planes and Projectiles. *Industrial Heating,* v. 15, Feb. 1948, p. 304, 306.
Summarizes paper by R. F. Geller of the National Bureau of Standards. (Presented at Autumn meeting of refractories division, American Ceramic Society.)

17-23. Mullite and Al_2O_3 Refractories. *Metal Progress,* v. 53, Feb. 1948, p. 279-280. Condensed from "Properties and Uses of Mullite and Pure Alumina Refractories", by G. B. Remmey.
Results of experimental work at temperatures from 3100 to 3500° F. on 12 compositions. Physical appearance of the samples after exposure to each of five temperatures. The 99% alumina and the "vitrified" alumina (98%) remained in good condition at 3500° F.

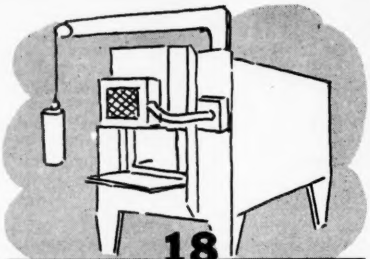
17-24. Economic Considerations for Stack Lining Repairs. W. R. Trognitz. *Steel,* v. 122, March 1, 1948, p. 110, 112.
Coke savings over a five-month period resulting from replacement of 24 ft. of brickwork above the mantel, more than paid over-all repair cost, and permitted detailed inspection of refractories and an increase in production. Details of the repair program. (Presented at Annual Winter Meeting of Eastern States Blast Furnace and Coke Oven Assoc., Pittsburgh, Feb. 6, 1948.)

17-25. Economic Considerations for Stack Lining Repairs. W. R. Trognitz. *Blast Furnace and Steel Plant,* v. 36, March 1948, p. 322-324.
Consideration of the various factors involved indicates that, under certain conditions, it is economically sound to repair blast-furnace linings after an initial operating period of 1600 days or more, although complete or partial failure has not made lining mandatory. (Presented at meeting of Eastern State Blast Furnace and Coke Oven Assoc., Feb. 6, 1948.)

17-26. High-Temperature Ceramics. E. L. Olcott. *Product Engineering,* v. 19, March 1948, p. 110-112.
The present state of development of high-temperature ceramics. Types of ceramics, physical characteristics, and molding methods.

17-27. Physical Changes in Re-Pressing of Refractories. *Industrial Heating,* v. 15, Feb. 1948, p. 308. Based on paper by J. O. Everhart, *Journal of the American Ceramic Society,* v. 30, Nov. 1, 1947, p. 345-348.
Presented at annual meeting of American Ceramic Society, Atlantic City.

For additional annotations indexed in other sections, see: 14a-50; 16a-18; 27a-39.



18 HEAT TREATMENT

18b—Ferrous

18b-24. Influence d'un Recuit Préalable du Fer dans l'Hydrogene sur son Comportement Ultérieur lors du Chargement a Froid en ce Gaz. (Effect of Preliminary Annealing of Iron in Hydrogen on Its Further Behavior After Cold Charging in This Gas.) Paul Bastien. *Comptes Rendus* (France), v. 225, Dec. 22, 1947, p. 1321-1322.
Silicon Armco irons were annealed 48 hr. at 880° C. in argon or hydrogen and their structures studied. It was found that annealing eliminates most impurities, and renders the iron more resistant to acid attack. Importance of the adsorbed surface layer of gas is emphasized.

18b-25. Recent French Work on Interrupted Quenching. Georges Delbart. *Metal Treatment,* v. 14, Winter 1947-48, p. 202-212.
An extended theoretical discussion; results clarified by charts, tables, and photomicrographs; applications; and conclusions. 22 ref.

18b-26. Nonmetallic Grain Boundary Material in Carburized Cases. John J. Kary. *Metal Progress,* v. 53, Feb. 1948, p. 218-222.
Machine parts often come from the carburizing process with a light scale, and grain boundaries at the surface are outlined by a nonmetallic substance. Results of a study of operating conditions that influence this effect, and of the nature of this nonmetallic phase.

18b-27. Magnetic Properties of Generator Rotors as Affected by Treatment. G. S. Downing, W. E. Jones, and L. E. Osman. *Metal Progress,* v. 53, Feb. 1948, p. 235-240.
Properties resulting from a five-stage heat treatment (equalize, anneal, age, low normalize, and high temper), giving well agglomerated and dispersed carbides.

18b-28. Nitrogen as a Carrier Gas in Gas Carburizing. W. H. Holcroft and R. P. Harris. *Metal Progress,* v. 53, Feb. 1948, p. 241-246.
In practice it is found that erratic results and shallow cases are likely to result when inert nitrogen is used as a carrier gas for methane or other hydrocarbons. Laboratory tests indicate that extremely minute amounts of H_2O and CO_2 upset the furnace atmosphere equilibrium, and that a moderate amount of CO and H_2 are required to offset this condition.

18b-29. Induction Hardening Cuts Cost of Heat Treating Grass Shear Blades by 60%. *Industrial Heating,* v. 15, Feb. 1948, p. 228, 230.
Use of induction hardening by Hancock Mfg. Co.

18b-30. Cyclic Annealing of Alloy Steel Forgings in Salt Baths. *Industrial Heating,* v. 15, Feb. 1948, p. 252, 254.
The extension of the scope of interrupted quenching operations to include cyclic annealing. Advantages.

18b-31. Gear Teeth Hardening by LeTourneau. Will C. Grant. *Industrial Gas,* v. 26, Feb. 1948, p. 7-9.

18b-32. Gardner-Denver Co. a Pioneer in Heat Treatment. Gerald Eldridge Stedman. *Industrial Gas,* v. 26, Feb. 1948, p. 11-14.
Equipment and procedures.

18b-33. Low-Temperature Treatment of Steel. H. E. Boyer. *Iron Age,* v. 161, Feb. 12, 1948, p. 69-73, 134-135; Feb. 19, 1948, p. 78-83.
In first part of a three-part article TTT-curves are used as a means of associating transformation characteristics of five different types of high-carbon steels with basic fundamentals of thermal treatment. In the second part an interesting correlation is shown between the volume of retained austenite before and after low-temperature treatment. The effect of tempering temperature on hardness and retained austenite volume of both cold treated and untreated steels.

18b-34. Low-Temperature Treatment of Steel. H. E. Boyer, *Iron Age,* v. 161, Feb. 26, 1948, p. 85-90.
How long should parts be held at the low temperature after the quench? Is there danger of cracking in parts subjected to low temperature? These and other typical operating questions are discussed for the benefit of the practical metallurgist and heat treater. The effect of low-temperature treatment on some medium-carbon structural steels and some alloy carburizing grades. (Concluded.)

18b-35. Bright Hardening and Tempering Tiny Parts. Part II. Harry L. Hovis and A. W. Marks. *American Machinist,* v. 92, Feb. 26, 1948, p. 112-115.
Bright tempering with hydrogen eliminated part discoloration and degreasing, and gave greater production and finer finish to watch parts and small tools.

18b-36. Processos de Patenteamento e Patenteamento Electrico de Arame. (Patenting Processes and Electric Patenting of Wire.) Jean Reuter. *Boletim da Associacao Brasileira de Metais,* v. 3, Oct. 1947, p. 624-630; discussion, p. 631-632.
Heat treatments applied to hard and semi-hard carbon-steel wires, generally known as "patenting" or "tempering with lead". An electric patenting installation which is used to improve the resistance of the wire.

18b-37. Flame Hardening. Charles Delmar Townsend. *Steel Processing,* v. 34, Feb. 1948, p. 71-74, 87.
Reviews process, including steels to which it is applicable.

18b-38. Sheet and Strip; Continuous Vs. Batch Annealing. T. F. Olt. *Iron and Steel,* v. 21, Feb. 1948, p. 69-72.
Metallurgical characteristics obtained from both methods of annealing, comparative mechanical properties of products produced by variations in practice within the economic limits of each method, statistics covering heat requirements for the different methods, and investment costs for each.

18b-39. End Hardening of Rail Ends and Openhearth Frogs. R. W. Torbert. *Welding Journal,* v. 27, Feb. 1948, p. 107-110.
Presented at 28th Annual Meeting, A.W.S., Chicago, week of Oct. 19, 1947.

18b-40. Flame Softening. *Industry and Welding,* v. 21, March 1948, p. 86
Unit for flame softening roller-chain pins developed by Union Chain and Mfg. Co.

18b-41. Annealing Malleable Iron. R. P.
(Turn to page 40)

Advantages of P-V Test Cited

Joining in a Joke at the Boston Chapter Meeting Are (Left to Right) A. Dudley Bach, Technical Chairman; B. F. Shepherd, Principal Speaker; and L. E. Geerts, Acting Chairman. (Photo by H. L. Phillips)

Reported by W. L. Badger
General Electric Co., River Works

A new talk on "Hardenability of Shallow Hardening Steels Determined by the P-V Test" was presented by B. F. Shepherd, chief metallurgist of Ingersoll-Rand Co., before the Boston Chapter A.S.M. on March 5.

With the help of slides and colored movies, Mr. Shepherd explained in detail the method of carrying out the P-V hardenability test and its advantages over other tests when applied to shallow hardening steels. He illustrated how the quenching gradient is increased in the P-V tests as compared with the Jominy or step tests, because of the 90° angle of the quenched specimen. The greater depth of hardening (to any selected reference hardness value) obtained with this test can be more accurately determined. The effect of minor variations in testing procedure has been carefully checked and good uniformity of results is obtained regardless of minor variations. Therefore, check tests between different laboratories give relatively consistent results.

According to Mr. Shepherd, there is too much propaganda, knowingly or unknowingly, advanced by our mathematically minded metallurgists that is downright misleading. Many tests are based on ideal conditions never encountered in practice, although they are useful in visualizing the general picture. "I feel sure," said Mr. Shepherd, "that some of the metallurgists who originated the basic work on calculated hardenability and ideal quenches realize this, but that the situation has got out of hand." He asked his audience to leave this mathematical dreamland and determine and apply facts.

Cooling rate data are useful in discussions of hardenability just as miles per hour is an easy way to express speed.

The coffee talk was given by H. L. Phillips, the Boston Chapter photographer, who presented colored movies illustrating the firing of 90-mm. and 16-in. Barbette coast defense guns.

Canadian Production and Uses of Aluminum Shown

Reported by A. R. Deir
Dominion Bureau of Statistics

Production of aluminum increased rapidly during the war years to meet the demand of the aircraft industry. Since the war, the facilities of this industry have been directed toward producing goods for peacetime consumption.

Gordon R. Black of the Aluminum Co. of Canada, Ltd., at a meeting of the Ottawa Valley Chapter A.S.M. on Feb. 3, spoke of the many uses to which this light metal is being put. Canada is now producing extruded shapes. The number of plants which anodize aluminum has increased to 24.

Advances have been made in welding technique, and new alloys have been developed which can be more readily welded and also have better physical properties. In illustrating the uses of aluminum, he mentioned pipes for irrigation, extruded shapes for building facings, superstructure of ships, lightweight freight cars, aluminum foil and collapsible tubes.

The film "This is Aluminum" presented various stages of production from bauxite ore through the reduction and fabricating processes to finished articles in use.

Essential Uses of Copper Alloys in Industry Shown

Reported by Louis Malpoker
Lincoln Engineering Co.

Copper and copper-base alloys are essential to the life of modern industry, and in this day of miracles the metallurgists of the world are discovering more and more applications for them. Thus indicating the importance of his subject, Oscar Frohman, consulting engineer, Ampco Metals, Inc., opened his talk on "Modern Engineered Bronzes and Their Use in Industry" before the St. Louis Chapter, with a short history of copper.

Copper alloyed with zinc forms brass and with tin forms bronze. A number of the elements will not alloy with copper, but many more will, such as zirconium, titanium, nickel, aluminum and iron. British metallurgists have done some fine work with copper alloys, Mr. Frohman said.

Many refineries are substituting bronze for ferrous alloys as a means of controlling corrosion and lowering cost. Copper's high thermal conductivity encourages its use in the gas turbine. Another useful advantage is that some copper alloys are stable, nonscaling and clean.

Many copper-base alloys are used for bearings. Bearing metal and lubrication go hand in hand, and whenever bearing failure occurs it is sometimes the fault of the bearing metal specification and not the lubricant, Mr. Frohman stated. In ball or roller bearings there is metal-to-metal contact, but in the sleeve type of bearing, if properly lubricated and in operation, there is no metal-to-metal contact. For good bearing performance there should be a difference in hardness between bearing and shaft of at least 50 Brinell numbers, the shaft being the harder.

Contrary to an old belief that copper cooking utensils are harmful and poisonous, Mr. Frohman pointed out that copper is essential for good health and is playing an important part in the processing of foods.

The speaker named three important factors that determine the use of copper-base alloys for deep drawing dies, namely dissimilarity of metals. type of alloy, and hardness.

Appointed Chicago Distributor

The appointment of the Johnson Welding Equipment Co. as Chicago district distributors of McKay electrodes has been announced by the McKay Co. The new distributor will handle the complete line of McKay mild steel, alloy steel and stainless steel welding electrodes.

Schauss. *American Foundryman,* v. 13, March 1948, p.34-38.

Modern annealing methods and equipment.

18b-42. Proper Precautions Eliminate Cracking in Toolsteel Heat Treatment. S. D. Smoke. *Materials & Methods,* v. 27, March 1948, p.86-88.

Much toolsteel is lost through careless and improper techniques in heat treating. Some points to watch to help eliminate such waste.

18b-43. The Stainless Steels. Part IV-A. Hardening and Annealing of the Low, Medium and High-Carbon Steels. Lester F. Spencer. *Steel Processing,* v. 34, Feb. 1948, p. 75-79.

Literature data correlated, tabulated and charted. 29 ref. (To be continued.)

18b-44. Production Heat Treating. *Steel Processing,* v. 34, March 1948, p.148-153.

Modern methods for heat treating ferrous metals. Improved furnaces, materials handling, control equipment, and induction heating. (To be continued.)

18c—Nonferrous

18c-2. Economical Short Run Stamping Dies. Walter G. Patton. *Iron Age,* v. 161, Feb. 12, 1948, p. 84-86.

Technique used by Ford Motor Co. for producing dies of Cerro-type alloys and chilling them to −320° F. in liquid nitrogen to give them the hardness and abrasion resistance required for stamping sheet-metal parts. Up to 250 parts can be stamped before the dies need rechilling. The technique provides an economical means for producing experimental stamped-sheet parts. Alloys are based on bismuth together with other metals which may or may not include zinc, lead, cadmium and antimony.

18c-3. Atmospheres and Controlled Atmosphere Furnaces for Nonferrous Metals. William Lehrer. *Metal Progress,* v. 53, March 1948, p. 393-402.

Modern practice in bright annealing of the heavy nonferrous metals and alloys, with some notes on recent practice in the precious metal industry.

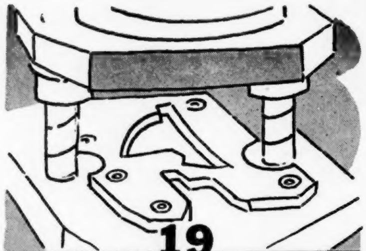
18d—Light Metals

18d-3. Heat Treatment of Aluminum Alloy Die Castings. Part 2. (Concluded.) R. A. Quadt. *Die Castings,* v. 6, March 1948, p. 37-38, 52-54.

Heat treatment to obtain dimensional stability, to relieve stresses, and to improve machinability. Effect on mechanical properties. In summary, it is shown that Al die castings can be heat treated successfully, contrary to some opinions.

For additional annotations indexed in other sections, see:

4b-9-11-16-18; 4c-16; 13-13; 16b-24-25-26; 21b-15; 22b-77; 24b-40; 24-25-26; 16d-1; 21b-15; 22b-77; 24b-40; 27d-5.



19 WORKING

19a—General

19a-31. Emulsifying Agents for Metalworking; German Practice in Manufacture and Use. P. D. Liddiard. *Metal Treatment,* v. 14, Winter 1947-48, p. 241-242.

A critical survey of B.I.O.S. Miscellaneous Reports No. 11 and 12.

19a-32. Die for Forming Irregular-shaped Spring. *Machinery* (London), v. 72, Jan. 29, 1948, p. 144.

19a-33. Multi-Punch and Man-Hours. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 101.

Time-saving applications of simultaneous punching of up to 80 holes of various sizes in a sheet-metal shop.

19a-34. Die-Grams. Karl L. Bues. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 124-125.

How to produce strap having two screw holes and four right-angle bends in one, two, or three operations.

19a-35. Metal Spinning. I. A. Shepard. *Modern Metals,* v. 4, Feb. 1948, p. 28-29.

Use for short production runs, pilot runs, experimental and sample work, and finally for long production runs where the shell is so designed that press tooling becomes excessively costly and the unit cost prohibitive.

19a-36. Improved D.C. Generators for Reversing Mills. C. Lynn and W. H. Burr. *Iron and Steel Engineer,* v. 25, Feb. 1948, p. 45-49; discussion, p. 50-55, 70.

Laminated steel generator frames, instead of the usual solid design, will give better operation of reversing mill d.c. generators during transient load changes. (Presented at A.I.S.E. Annual Convention, Pittsburgh, Sept. 22, 1947.)

19a-37. Designing of "Trouble-Free" Dies. Part LXXVIII. Classification and Installation of Presses. C. W. Hinman. *Modern Industrial Press,* v. 10, Feb. 1948, p. 20.

19a-38. The Inspection and Maintenance of Diamond Wire Drawing Dies. *Wire and Wire Products,* v. 23, Feb. 1948, p. 140-143.

The information presented was issued by a Technical Committee consisting of die users and makers at the request of the Council of the British Diamond Die Federation.

19a-39. Closely Controlled Forming Operations Used to Fabricate Copper-Bottom Stainless Containers. Gerald Eldridge Stedman. *Steel,* v. 122, March 1, 1948, p. 102, 104, 126, 128.

Equipment and procedures.

19a-40. A Calculation of Internal Stresses Due to Cold Extension or Compression. H. Brandenberger. *Engineers' Digest,* v. 5, Feb. 1948, p. 67-70. Translated and condensed from *Schweizer Archiv,* v. 13, Aug. 1947, p. 232-238; Sept. 1947, p. 268-275.

Previously abstracted from original source. See R.M.L., v. 4, 1947, items 19-387 and 19-451.

19a-41. Determinacao do Motor e do Volante dos Trens de Laminacao. (Design of Motors and Flywheels of Rolling Mills.) Jose Rossi, Jr., and Joaquim I. de Compos Nobrega. *Boletim da Associacao Brasileira de Metais,* v. 3, Oct. 1947, p. 684-705.

Operating diagrams were used as the basis of study of problem of design of motors and fly wheels. The effect of control and lubrication on power required. The calculation is illustrated by a specific example.

19a-42. Errors in Determination of Specific Pressure by Means of the Crushing Method. (In Russian.) D. I. Suyarov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Dec. 1947, p. 1497-1499.

The deformation of materials during crushing or forming. Direct graphic differentiation seems to produce better results than the method proposed by Pomp and Houben. However, values in the initial part of the curve are shown to be unreliable by means of experiments on impact upsetting (forming) of lead.

19a-43. The Rolling of Metals: Theory and Experiment—Part XV. Discussion of Certain Practical Rolling Problems in the Light of the Theory of Rolling. (Continued.) L. R. Underwood. *Sheet Metal Industries,* v. 25, Feb. 1948, p. 297-302, 308.

This installment is devoted to roll shape, or camber, and its effects. (To be continued.)

19a-44. The Care and Maintenance of Press Tools. W. M. Halliday. *Sheet Metal Industries,* v. 25, Feb. 1948, p. 351-353.

First of a series dealing with some important features of press tool design, and with the operating factors and maintenance essential to ensure smooth, trouble-free production service and economy in use. (To be continued.)

19a-45. Drawing Lubricants. W. J. Haring. *Steel Processing,* v. 34, Feb. 1948, p. 84-87.

Chemistry of drawing lubricants. (Presented at meeting of New England District Pressed Metal Institute, Jan. 13, 1948.)

19a-46. A Theoretical Analysis of the Stresses and Strains in Extrusion and Piercing. R. Hill. *Journal of the Iron and Steel Institute,* v. 158, Feb. 1948, p. 177-185.

Power consumption and distribution of stress and strain in extrusion and piercing are calculated from the equations of plastic flow developed by Hencky and Geiringer. Determination of the shape of the plastic region and the motion of individual elements is an essential part of the analysis, and distinguishes it from all earlier theories. Pressures of extrusion and piercing are evaluated for both square and conical dies over a wide range of reductions in area and frictional conditions. The deformation of a square grid scribed on a longitudinal section is calculated in the case of inverted extrusion with 50% reduction. 11 ref.

19a-47. Use of Rubber Dies for Blanking Thin Laminations. *Machinery* (London), v. 72, Feb. 12, 1948, p. 216. Based on B.I.O.S. Report No. 1527.

German methods. Pure Ni and an alloy of 91% Fe and 9% Al were used. Suitable for material 0.004 to 0.012 in. thick.

19a-48. Ingenious Die Design Increases Versatility of Press Brake. W. Earl Peters. *Machinery,* v. 54, March 1948, p. 168-175.

A wide variety of designs for miscellaneous applications.

19a-49. Tungsten Carbide Blanking

(Turn to page 42)

Metallurgical Books

By Sibyl E. Warren

Lingren Library, Mass. Inst. of Technology

A Bibliography, Classified by Subject Matter, of Metallurgical and Near-Metallurgical Books Published in the Years 1936-1946

THE FIRST installment in this bibliography was published in the March issue of *Metals Review.* It covered Section I on General Metallurgy and Section (A) on Process Metallurgy, as shown in the classification scheme alongside. The present portion comprises Section (B) on Physical Metallurgy in General, and B-1 on Structure and Properties of Metals and Alloys. Subsequent issues will carry succeeding sections of the bibliography, as listed in the classification scheme.

* * *

Classification Scheme

I. Metallurgy (in General)

(A) Process Metallurgy

1. Ore Dressing
2. Pyrometallurgy, Hydrometallurgy, Electrometallurgy
3. Furnaces, Refractories, Fuels, Slags, Temperature, Pyrometry
4. Other Processes: Forging, Rolling, Extrusion, Drawing, Stamping, Spinning, Machining
5. Surface Treatment
   (a) Plating, Galvanizing
   (b) Enameling, Coloring, Spraying
   (c) Others

(B) Physical Metallurgy

1. Structure and Properties of Metals and Alloys
   (a) Phase Relations
2. Metallography
   (a) Microscope, Polishing, Etching
   (b) X-Ray Analysis, Radiography
3. Heat Treating
4. Testing and Mechanical Properties
5. Corrosion and Oxidation

(C) Mechanical Metallurgy

1. Powder Metallurgy
2. Casting
   (a) Patterns, Molds, Foundry Sands
3. Welding and Cutting
   (a) Electric
   (b) Gas
   (c) Soldering

II. Metals (in General)

(a) Analysis

(A) Ferrous

(a) Biography, Economics, History
1. Iron
   (a) Cast
   (b) Iron and its Alloys
2. Steel
   (a) Special Steels

(B) Nonferrous

1. Aluminum, Magnesium
2. Brass, Bronze, and Bearing Metals
3. Copper
4. Gold, Silver, Platinum, and Other Precious Metals
5. Other Nonferrous Metals and Alloys

B. Physical Metallurgy

(In General)

American Society for Metals. **Hardenability of Alloy Steels (Medium and Low Alloy Steels up to 5% Alloy).** Society, Cleveland, 1939, 318 p.

American Society for Metals. **Metals Handbook.** Society, Cleveland, 1939, 1803 p.

American Society for Metals. **Metals—How They Behave in Service.** Society, Cleveland, 1939, 45 p.

Bochvar, A. A. **Metallovedenie (Metallurgy).** Ed. 4, rev. & enl. Metallurgizdat, Moscow, 1945, 404 p.

Coonan, F. L. **Principles of Physical Metallurgy.** Harper & Brothers, New York, 1943, 238 p.

Doan, G. E. and Mahla, E. M. **The Principles of Physical Metallurgy.** Ed. 2. McGraw-Hill Book Co., Inc., New York, 1941, 388 p.

Eddy, C. T. and Marcotte, R. J. **Fundamental Principles in Physical Metallurgy.** Edwards Brothers, Inc., Ann Arbor, Mich., 1940, 248 p.

Evans, R. C. **Introduction to Crystal Chemistry.** University Press, Cambridge, England, 1939, 388 p.

Gordon, G. F. C. **Elementary Metallurgy for Engineers.** Ed. 2, rev. Constable & Co., London, 1936, 166 p.

Grosvenor, A. W. and others. **Metal, Inside Out.** American Society for Metals, Cleveland, 1941, 115 p.

Guertler, Wilhelm. **Metall-technisches Taschenbuch.** J. A. Barth, Leipzig, 1939, 370 p.

Hall, E. H. **A Dual Theory of Conduction in Metals.** Murray Printing Co., Cambridge, Mass., 1938, 170 p.

Handbuch der Metallphysik; unter Mitwirkung zahlreicher Fachgenossen. Herausgegeben von G. Masing. Akademische Verlagsgesellschaft, Leipzig, Bd. 1-3, 1935-44.

Hessenbruch, Werner. **Metalle und Legierungen fuer hohe Temperaturen.** J. Springer, Berlin, Tl. 1, 1940, 254 p.

Heyer, R. H. **Engineering Physical Metallurgy.** D. Van Nostrand Co., Inc., New York, 1939, 549 p.

Houwink, Roelof. **Elasticity, Plasticity and Structure of Matter.** University Press, Cambridge, England, 1937, 376 p.

Hume-Rothery, William. **Atomic Theory for Students of Metallurgy.** Institute of Metals, London, 1946, 286 p.

Johnson, C. G. **Metallurgy.** Rev. ed. American Technical Society, Chicago, 1942, 262 p.

Johnson, C. G. **Metallurgy.** Ed. 3. American Technical Society, Chicago, 1946, 418 p.

Johnson, Frederick. **Metal Working and Heat Treatment Manual.** Paul Elek., Ltd., London, 1945, v. 1.

Joint Research Committee on effect of Temperature on the Properties of Metals, Creep Data Section. **Compilation of Available High-Temperature Creep Characteristics of Metals and Alloys.** American Society for Testing Materials, Philadelphia, 1938, 848 p.

Jost, Wilhelm. **Diffusion und chemische Reaktion in festen Stoffen.** Theodor Steinkopff, Dresden and Leipzig, 1937, 231 p.

Klemm, Wilhelm. **Magnetochemie.** Akademische Verlagsgesellschaft, Leipzig, 1936, 262 p.

Masing, Georg. **Grundlagen der Metallkunde in anschaulicher Darstellung.** J. Springer, Berlin, 1940, 127 p.

Nardo, J. B. de. **Metalurgia fisica y sus aplicaciones industriales.** José Monteso, Barcelona & Buenos Aires, 1946, 518 p.

Paterson, D. G. P. and Bearn, J. **An Outline of Industrial Metallurgy.** Chapman and Hall, Ltd., London, 1944, 185 p.

Rollason, E. C. **Metallurgy for Engineers.** Longmans, New York, 1939, 272 p.

Sachs, George and Van Horn, K. R. **Practical Metallurgy.** American Society for Metals, Cleveland, 1940, 567 p.

Seitz, Frederick. **The Modern Theory of Solids.** McGraw-Hill Book Co., Inc., New York, 1940, 698 p.

Seitz, Frederick. **The Physics of Metals.** McGraw-Hill Book Co., Inc., New York, 1943, 330 p.

Sisco, F. T. **Modern Metallurgy for Engineers.** Pitman Publishing Corp., New York, 1941, 426 p.

Stillwell, C. W. **Crystal Chemistry.** McGraw-Hill Book Co., Inc., New York, 1938, 431 p.

Van Wert, L. R. **An Introduction to Physical Metallurgy.** McGraw-Hill Book Co., Inc., New York, 1936, 272 p.

Vivian, A. C. **Essential Metallurgy for Engineers.** I. Pitman & Sons, Ltd., London, 1942, 155 p.

Wilson, A. H. **Semi-Conductors and Metals: an Introduction to the Electron Theory of Metals.** University Press, Cambridge, England, 1939, 119 p.

Wilson, A. H. **Theory of Metals.** University Press, Cambridge, England, 1936, 272 p.

(Turn to page 43)

Dies. E. J. Reitler and C. R. Harmon. *Tool Engineer,* v. 20, March 1948, p. 47-49.

Trend toward more use of carbides. Recommended designs.

19a-50. 50% to 1000% Production Increases Possible With Automatic Feeding of Progressive Dies. C. A. Hollister. *Machine and Tool Blue Book,* v. 44, March 1948, p. 171-172, 174, 176, 178, 180, 182, 184, 186.

Increased output, less operator fatigue, elimination of die damage, and increased safety for operators, are among the advantages of automatic die feeding. Correct die design for varying die and press problems.

19a-51. Press Lines Speed Flow of Parts for Ford Lamp Assemblies. P. D. Aird. *Modern Industrial Press,* v. 10, March 1948, p. 13-14, 18, 24.

19a-52. Designing of "Trouble-Free" Dies. Part LXXIX. Classification and Installation of Presses. C. W. Hinman. *Modern Industrial Press,* v. 10, March 1948, p. 20, 51.

19a-53. Designing Rolls for Cold Roll Forming. E. J. Vanderploeg. *Machinery,* v. 54, March 1948, p. 176-180.

Methods for machining each pass for cold forming rolls and materials used in making the rolls. (To be continued.)

19a-54. How to Get the Most Out of Punch Presses. Part I. C-Frame Presses. Part II. Double-Crank, Straight-Side Presses. E. H. Girardot. *American Machinist,* v. 92, Feb. 26, 1948, p. 79-82; March 11, 1948, p. 174-177.

Beginning of a series based on an extensive study of the various forms of presses. (To be continued.)

19a-55. Electrical Applications in the Wire Industry. J. G. Roby. *Wire and Wire Products,* v. 23, March 1948, p. 213-220, 265-266.

Different types of wire-drawing machines and the electrical drives for each.

19a-56. Carbide Dies Cut Costs. *Business Week,* March 13, 1948, p. 58-60.

Wartime development and its advantages and uses in presswork.

19b—Ferrous

19b-26. The Metallurgy of Cold Reduced Sheets. C. L. Altenburger. *Yearbook of the American Iron and Steel Institute,* 1947, p. 459-492; discussion, p. 492-495.

The more important phases of the control and production of cold reduced rolled sheets with emphasis on information which has not previously appeared in the literature. Mechanisms of rimming and capping in ingots; symptoms of segregation; causes of strain aging; effects of additions of nitrogen; aluminum deoxidation; and use of vanadium, silicon, and zirconium, and free energy values of different metal nitrides. Drawability of cold reduced sheets. (Presented at A.I.S.I. Meeting, New York, May 21-22, 1947.)

19b-27. Stress Concentration and Fatigue Failures. O. Föppl. *Engineer,* v. 185, Jan. 30, 1948, p. 114-115.

Areas of disagreement with S. Timoshenko regarding experimental data and fundamental concepts of the process for raising the endurance limit of highly stressed parts by surface compression.

19b-28. Torsion-Bar Springs. *Engineer,* v. 185, Jan. 30, 1948, p. 115. Translated and condensed from paper by O. Föppl, *Automobiltechnische Zeitschrift,* no. 4, 1947.

Use of "roller-peening" process to increase resistance to fracture of suspension springs used in German tanks. The principle of roller-peening is the same as that of shot-peening. Föppl preferred the former.

19b-29. Fontana Increases Rolling Mill Facilities. J. M. Hooper. *Blast Furnace and Steel Plant,* v. 36, Feb. 1948, p. 197-204.

Progress report on what is being done at the Kaiser Co.'s Fontana plant to speed the production of steel, and to diversify the mill's output to meet the requirements of the Western market. Layout of the mills and roll shapes for the different steps in rolling of various shapes.

19b-30. J. & L. Rolls Tinplate at 70 Miles per Hour. *Iron and Steel Engineer,* v. 25, Feb. 1948, p. 99-102.

19b-31. Chevrolet-Indianapolis Door-Line Sets a Fast Pace for Production. P. D. Aird. *Modern Industrial Press,* v. 10, Feb. 1948, p. 13-14, 18, 42.

Including miscellaneous press operations, welding, and assembly.

19b-32. Efficient Production of Screen and Storm Sash in New Corry-Jamestown Plant. Walter Rudolph. *Modern Industrial Press,* v. 10, Feb. 1948, p. 22, 24, 26, 30, 47.

Miscellaneous fabrication operations for steel sash.

19b-33. The Fabrication of Sheet Metal Bathtubs at Norris Stamping and Manufacturing Co. Gerald E. Stedman. *Modern Industrial Press,* v. 10, Feb. 1948, p. 38, 40, 42.

19b-34. Cold Heading Cuts Manufacturing Costs. Chester S. Ricker. *American Machinist,* v. 92, Feb. 26, 1948, p. 89-91.

How replacing screw-machine or milling operations by cold heading can effect over 50% material and labor saving. Stages in bolt manufacture and typical parts produced by cold heading.

19b-35. Skilled Diemaking Permits Intricate Drawing of Integrator Housing. Dan Reebel. *Steel,* v. 122, March 1, 1948, p. 96-98.

Forming of complex-shaped housing for a mechanism used in the Bailey fluid meter, from 16-gage deep drawing sheet steel.

19b-36. Fabricacao de Tubos de Aco. (Manufacture of Steel Tubes.) Henri Meyers. *Boletim da Associacao Brasileira de Metais,* v. 3, Oct. 1947, p. 643-662; discussion, p. 663-666.

A brief review of methods of manufacturing seamless-steel tubing is followed by a more detailed description of two continuous processes for the manufacture of welded tubes—the Fretz-Moon system and the electric resistance welding process, as applied in Brazil. Due to economic conditions, the electric welding method is considered more suitable at present.

19b-37. Description of Plant: Merchant-Bar and Wire-Rod Mill at the Dalzell Steel Works, Motherwell. *Journal of the Iron and Steel Institute,* v. 158, Feb. 1948, p. 254-256.

(Presented at 5th meeting of Iron and Steel Engineers Group, Iron and Steel Institute, London, Nov. 26, 1947.)

19b-38. Giant Presses Increase Automotive Frame Output. Walter Rudolph. *Modern Industrial Press,* v. 10, March 1948, p. 26, 28, 30, 34, 36.

Equipment and procedures at Midland Steel Products Co., Detroit and Cleveland.

19b-39. Hobbing Steel Cavities. William Edwards. *Western Metals,* v. 6, Feb. 1948, p. 29-30.

Process and its advantages and limitations.

19b-40. Modern Electric Equipment for Cold Strip Reduction Mills. W. E. Miller. *General Electric Review,* v. 51, March 1948, p. 22-29.

The requirements of motors and controls for modern high-speed tandem mills.

19b-41. Jones & Laughlin Improves Facilities for the Manufacture of Tin Plate. *Blast Furnace and Steel Plant,* v. 36, March 1948, p. 317-321.

19b-42. Modern Small Rolling Mills. Part II. (Continued.) G. A. Phipps. *Blast Furnace and Steel Plant,* v. 36, March 1948, p. 337-342.

Continues description of various British mills. Several layout diagrams. (Presented at meeting of Iron and Steel Institute of Great Britain.)

19b-43. Determining the Origin of Surface Defects in Rolled Steel Products. V. E. Elliott and C. L. Meyette. *Railway Age,* v. 124, March 6, 1948, p. 54-56.

The various types of defects that appear in finished products, some of which appeared in the ingot and others which were formed during rolling. (Condensed from paper pre-

19b-44. Hot Pressing 575-Pound Propeller Hubs. Frank Welshner and A. A. Flout. *Steel,* v. 122, March 15, 1948, p. 90-92, 121.

Use of specially designed multiple-acting hydraulic equipment realizes great savings in forging, heat treating, and machining time on S.A.E. 4340 steel parts at Canton Drop Forging & Mfg. Co.

19b-45. New British Mill Rolls Light Special Sections. *Steel,* v. 122, March 15, 1948, p. 112, 115.

Two-stand roughing, 3-stand intermediate, and 2-stand finishing mill with average production of 75 tons per turn.

19c—Nonferrous

19c-8. Oneida, Ltd., Uses Large Number of Modern Presses to Make Famous Hollow Ware Line. Floyd McKnight. *Modern Industrial Press,* v. 10, Feb. 1948, p. 32, 34, 36.

19c-9. A Sixteen-Station Progressive Die. Hans Effgen. *Tool & Die Journal,* v. 13, March 1948, p. 69-71.

The 16 steps required for formation of socket contact from 0.010-in. Be-Cu strip. This contact is required to have a holding or gripping power of 170 g. when the 0.030-in. diameter portion is pushed onto a smooth wire measuring 0.040 in. in diameter.

19c-10. High Speed Stamping of Electrical Terminal Plugs. Herbert Chase. *Iron Age,* v. 161, March 18, 1948, p. 64-72.

Through intricate tooling of U. S. Multi-Slide machines, a progressive die arrangement blanks and forms hard brass and beryllium-copper strip into electrical terminals at rates up to three per sec., holding extremely close dimensional tolerances at critical points.

19c-11. Soft Alloys Used to Make Short Run Sheet Metal Dies. Kenneth Rose. *Materials & Methods,* v. 27, March 1948, p. 83-85.

Nitrogen hardened soft metals can be used to produce dies and sample parts within 24 to 48 hr., as compared to weeks required when the usual die materials were used. The alloy is a variation of Wood's metal known as Cerrobend.

19d—Light Metals

19d-13. Postup Vyroby Hlinikovych Folii v Zavodech SSSR. (Description of Attempt to Produce Aluminum Foil by Methods Used in the U.S.S.R.) Petr Skulari. *Hutnicke Listy,* (Metallurgical Topics), v. 2, Dec. 1947, p. 121-124.

Methods used in the U.S.S.R. and variations from the Czechoslovakian process. Details of an attempt to duplicate the Russian process.

19d-14. Aluminum Goes to Press. Part

(Turn to page 44)

METALLURGICAL BOOKS

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1. Structure and Properties of Metals and Alloys

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American Society for Testing Materials. **Symposium on High-Strength Constructional Metals.** Society, Philadelphia, 1936, 126 p.

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Bates, L. F. **Modern Magnetism.** University Press, Cambridge, England, 1939, 339 p.

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(a) Phase Relations

Bowden, S. T. **The Phase Rule and Phase Reactions: Theoretical and Practical.** Macmillan and Co., Ltd., London, 1938, 303 p.

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Sakharov, M. V., Rumyantsev, M. V. and Turkin, V. D. **Constitutional Diagrams of Binary and Ternary Metallic Systems.** (In Russian.) Metallurgizdat, Moscow, 1940, 232 p.

I. E. V. Sharpnack. *Tool & Die Journal,* v. 13, Feb. 1948, p. 52-54, 70.

Information essential to successful specifying, handling, drawing, forming, blanking, and piercing of aluminum sheet stock.

19d-15. Spinning Magnesium. Leslie F. Hawes. *Iron Age,* v. 161, Feb. 19, 1948, p. 72-73.

Practical considerations. Lubricants for both hot and cold work; chromic acid cleaning solution formulas for removing graphite and other lubricants; and heating procedures for jobs demanding severe forming of the metal.

19d-16. New Brake Cuts Aluminum Foil Costs. *Modern Metals,* v. 4, Feb. 1948, p. 16-17.

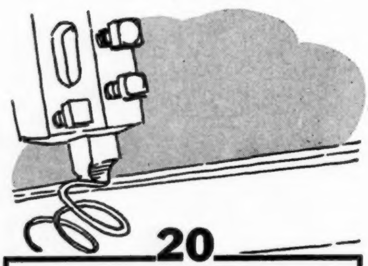
Use of Linderman air-operated tension brakes on aluminum foil mills, double spoolers, and spooler and trimmer machines, to decrease down time for rethreading and to eliminate foil breakage due to undesirable variations in tension.

19d-17. Works Practice in the Rolling and Extrusion of Aluminum at the Rogerstone Works of the Northern Aluminium Co., Ltd. (Continued.) Alastair McLeod. *Sheet Metal Industries,* v. 25, Feb. 1948, p. 285-296.

Concludes description of the Robertson 14 x 32 in. two-high reversing mill for finish strip rolling; and describes the No. 2 hot mill, including the reheating and coil annealing furnaces, and also the plant for extrusion and wire drawing. (To be continued.)

For additional annotations indexed in other sections, see:

21a-42; 22b-79-96-97; 23b-20; 24a-67-73; 27a-40.



20 MACHINING and MACHINABILITY

20a—General

20a-87. The Works of Jones & Shipman, Ltd. *Machinery* (London), v. 72, Jan. 29, 1948, p. 135-139.

Machining and finishing equipment and procedures of British factory for manufacture of machine and hand tools.

20a-88. Machine Filing. A. G. Arend. *Machinery* (London), v. 72, Jan. 29, 1948, p. 145.

Use of endless-band type of filing machine in preference to the reciprocating type.

20a-89. The Evaluation of Cutting Fluids in Laboratory Equipment. L. H. Sudholz. *Lubrication Engineering,* v. 4 Feb. 1948, p. 18-24.

The theory of metal cutting and details of evaluation methods, both physical and chemical. Typical cutting fluid types.

20a-90. Single Point Boring Tools—Vibration Versus Precision. A. W. Ehlers. *Industrial Diamond Review,* v. 8, Feb. 1948, p. 46-47. Condensed from *Tool & Die Journal,* v. 12, Feb. 1947, p. 68-70.

Previously abstracted from original paper. See item 20-93, R.M.L., v. 4, 1947.

20a-91. Production Processes — Their Influence on Design. Part XXXI—Automatic and Shape Turning. Roger W. Bolz. *Machine Design,* v. 20, Feb. 1948, p. 129-134.

20a-92. Tables for Step Corrections on 5° Top Rake Circular Tools for Brown & Sharpe Automatics. Roy M. Spaulding. *Screw Machine Engineering,* v. 9, Feb. 1948, p. 42-46.

Includes also a description of their use.

20a-93. Diamond Truing Without Interrupting Grinding Cycle. *Industrial Diamond Review,* v. 8, Feb. 1948, p. 54.

20a-94. Tool Design in Calculator Production. William B. Nonamaker. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 82-85, 116-117, 122.

Procedures and equipment used at Friden Calculating Machine Co.

20a-95. Solid Carbide Boring Bars. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 104-105.

Properties, design, and applications.

20a-96. You Can Use Cemented Carbide Tools Successfully. J. W. Suley. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 106.

Practical principles of their use.

20a-97. Operating Techniques for Carbide Milling. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 109-114, 122.

Condensed from "Milling with Carbides," Milling Cutter Division, Metal Cutting Tool Institute.

20a-98. Tooling for Wineries. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 115.

Production of miscellaneous winemaking machinery.

20a-99. Broaching on the Automatic Screw Machine. C. H. Wummel. *Screw Machine Engineering,* v. 9, Feb. 1948, p. 25-27.

Illustrated by use of a typical example.

20a-100. Profit by Advanced Engineering. J. T. Vinbury. *Screw Machine Engineering,* v. 9, Feb. 1948, p. 30-33.

Details of tooling for production of part in 5.87 sec. on a New Britain, 6-spindle, automatic screw machine, Model 601. Previous method required a brass casting and individual operations for each machining operation.

20a-101. Complex Bending Operations Performed on the Automatic Screw Machine. C. H. Wummel. *Screw Machine Engineering,* v. 9, Feb. 1948, p. 36-37, 40-41.

Method whereby two complex double-bending jobs are completed on the automatic screw machine by combined movements of the vertical turret and cross slides. A Brown & Sharpe machine equipped with a spindle brake is used.

20a-102. Stock Ends. *Screw Machine Engineering,* v. 9, Feb. 1948, p. 49.

Increased Threading Capacity (of No. 2 B. & S. Automatics to 1½-In. Diam.) by John Ozga; Turret Tool Stop, by E. J. Rondeau; and Burring Parts, by J. Harrow.

20a-103. Screw Machine Engineering Data Sheet; Dovetailed Forming Tool Holders. *Screw Machine Engineering,* v. 9, Feb. 1948, p. 55. Reprinted from American Standard, Circular and Dovetailed Forming Tool Blanks, B5, 7-1943, American Standards Association, 70 E. 45th St., New York.

Diagrammed and dimensions tabulated.

20a-104. Precipitating Oil Coolant Mist Electrostatically. *Steel,* v. 122, Feb. 23, 1948, p. 86-87, 115.

How removal at its source of mist generated by high-speed machining operations improves working conditions and eliminates a fire hazard.

20a-105. Contour Sawing Hardened Steels and Carbides. *Iron Age,* v. 161, Feb. 26, 1948, p. 73.

Diamond band saw for cutting tungsten carbides and hardened steel, as well as stone and vitreous materials, to a layout line with precision comparable to that of conventional contour sawing.

20a-106. Use of Single-Tool Boring Tools. *American Machinist,* v. 92, Feb. 26, 1948, p. 133, 135, 137.

20a-107. Practical Ideas. *American Machinist,* v. 92, Feb. 26, 1948, p. 117-122.

Fly cutters set progressively for even distribution of cutting load (George C. Allen); toolholder block with cutting-oil holes to speed cutoff (John J. Moffatt); internal collet grips turnings for close concentric machining (George W. Brown); templet and follower fixture for turning of spheroids (F. G. Fonquen); quick-acting fixture for jig closing (H. Moore); spindle stop converts engine lathe into cutoff machine (Allen B. Nixon); and other miscellaneous shop hints.

20a-108. Rings, Pistons and Liners. *Automobile Engineer,* v. 38, Feb. 1948, p. 51-61.

Machine-shop production methods at a British firm. Both light alloys and ferrous materials are used.

20a-109. The Production of High-Speed Oil Engines. *Machinery* (London), v. 72, Feb. 12, 1948, p. 203-210.

Machine-shop operations, assembly, and testing at British firm. Steel and aluminum alloys are used.

20a-110. Cemented Carbide Milling Cutters and Their Application. H. Eckersley. *Machinery* (London), v. 72, Feb. 12, 1948, p. 211-214.

Nomographs for feed rates corresponding to metal-removal capacities, horsepowers, and areas of cut; and for relationships between feed, r.p.m., number of effective teeth, tooth load, cutter diameter, and speeds of cutter periphery. Causes of cutter wear and establishment of operating data.

20a-111. Production Problems Solved by Special Machine Attachments. Gerald Eldridge Stedman. *Production Engineering & Management,* v. 21, March 1948, p. 57-60.

Several ingenious adaptations of standard machine tools to special requirements for long-run operations.

20a-112. Streamlined Production. *Production Engineering & Management,* v. 21, March 1948, p. 62-68.

Use of new machine tools along with an improved arrangement of existing equipment to increase efficiency and boost output of diesel engines.

20a-113. An Indexing Drill Jig for Accuracy and Rapid Loading. Robert Mawson. *Production Engineering & Management,* v. 21, March 1948, p. 69-71.

Basic principles which govern the design of efficient drill jigs are incorporated in the development in which the work is held stationary and the bushing plate is indexed.

20a-114. Tooling and Production of the Apex Fold-A-Matic Ironer. Part II. Carl F. Benner. *Tool & Die Journal,* v. 13, March 1948, p. 72-74.

Operations on transmission and gear case, and for milling the bottom face of the housing. (To be continued.)

20a-115. Special Tools for Special Purposes. *Tool & Die Journal,* v. 13, March 1948, p. 86-88.

Describes and illustrates some tools made by National Tool Co., Cleveland, and their applications.

20a-116. Cams—Their Production and

(Turn to page 46)

Localized Corrosion Often Misinterpreted

Reported by Joseph A. Graber
Assistant Supervisor of Methods
Revere Copper & Brass, Inc.

An unusually large and interested audience greeted R. B. Mears, manager of Carnegie-Illinois Steel Corp. research laboratory, when he explained the causes of localized corrosion in ferrous and nonferrous metals to the Baltimore Chapter at the February meeting.

When a metallic article does not corrode at all or even when it corrodes all over, the user does not as a rule consider that the metal was defective. However, if it shows severe local attack, the user frequently believes the metal was "dirty" or contained "inclusions".

Dr. Mears pointed out that such localized attack normally occurs in the boundary region between complete resistance to corrosion and corrosion over the entire exposed area of the surface. Such localized attack can be caused by inhomogeneities in the metal but, under service conditions, this is rarely the cause effective.

In service, localized corrosion is generally produced by inhomogeneities in the environment. The most common cause is local differences in oxygen concentration in the liquid contacting the metal surface. Local differences in other soluble constituents of the solution, in heating, agitation, abrasion, and illumination, can also caus' localized attack.

Charts and photographs were shown b' Dr. Mears to illustrate the action of these various environmental inhomogeneities in causing localized attack.

Theories of Failure at High Heat Propounded

Reported by J. A. Cameron
Metallurgist, Elliott Co.

Francis B. Foley, national president of A.S.M. and superintendent of research for the Midvale Co. spoke before the Pittsburgh Chapter on "Behavior of Metals Under Stress at Elevated Temperatures" on Feb. 12. The occasion was National Officers' Night, and an informal dinner preceded the meeting. In addition to President Foley, the national officers were represented by Vice-President Work.

The talk was prefaced by a witty introduction by M. A. Grossmann, director of research, Carnegie-Illinois Steel Corp. Dr. Grossmann drew several humorous analogies between the careers of Abraham Lincoln, on whose birthday the meeting was held, and Mr. Foley.

Mr. Foley opened his talk by telling the Chapter a little of national affairs. His technical address consisted of a review of creep rates and rupture strengths when metals and alloys are stressed for long times at elevated temperatures. Discussion after the talk centered principally around various theories of high-temperature failure. Although no general agreement could be reached, several thought-provoking theories were propounded.

Heat Treating Plant Purchased

The Nerl Corp. of South Bend, Ind., has purchased the heat treating facilities owned by the South Bend Tool & Die Co., and will henceforth be known as Nerl Heat Treat Corp.

New Movie Filmed on Location

A novel departure in industrial movies distinguishes the new film "A Machine of the Age" from previously released films showing the abrasive belt machining method. Many of the sequences of the new film were made during working hours and under actual working conditions in different shops throughout the country.

The film is black and white, 16 mm., and equipped for sound. Running time is 30 min. It is obtainable free of charge, except return postage, from the Porter-Cable Machine Co., 1714 North Salina St., Syracuse 8, N. Y.

Application. John E. Hyler. *Machine and Tool Blue Book,* v. 44, March 1948, p. 199-200, 202, 206, 208, 210, 212, 214.

Use of a profiling machine to trace small cams from a 5×-oversize layout made on plastic sheets, then transferred to a sensitized metal plate which acts as master from which the finished cam is made.

20a-117. Production Processes—Their Influence on Design. Part XXXII—Production Grinding, General Considerations. Roger W. Bolz. *Machine Design,* v. 20, March 1948, p. 135-141.

20a-118. Automatic Cutter Grinder Has Noteworthy Design Features. *Machine Design,* v. 20, March 1948, p. 160-162.

Designed for sharpening face mill cutters, with automatic grinding-wheel dressing for each tooth grind. Powered and cycled hydraulically.

20a-119. Roller Ways in Grinder Cut Table Friction to Minimum. *Machine Design,* v. 20, March 1948, p. 162-163.

New B. & S. machine tool. Blueprint-type diagram.

20a-120. Setups for Grinding Milling Cutters. Freeman C. Duston. *Machinery,* v. 54, March 1948, p. 150-157.

Examples showing procedures in sharpening milling cutters, end-mills, formed cutters, and similar tools. (To be continued.)

20a-121. From Jaquet-Droz's Automatons to Billeter's Universal Machine. Alfred Chapuis and Edmond Droz. *Microtechnic,* v. 1, Dec. 1947, p. 134-137. (For figures see French section, p. 300-307.) Translated from the French.

Details of European-made machine tool which accomplishes many sorts of complicated operations.

20a-122. Automatic Drilling and Tapping Machines. *Die Castings,* v. 6, March 1948, p. 66-68, 70, 73-74.

Describes and illustrates these machines and gives basic operating principles. Setups for several typical production jobs.

20a-123. Job Planning on the Turret Lathe. E. L. Murray. *Tool Engineer,* v. 20, March 1948, p. 33-40.

Typical tool setups for first and second operation work. (Concluded.)

20a-124. An Old Friend in the "New Look". Karl Stad. *Tool Engineer,* v. 20, March 1948, p. 50.

Fixtures for holding round parts from turning against heavy drill torque.

20a-125. How to Gun-Drill for Fine Finish. James Harris. *American Machinist,* v. 92, March 11, 1948, p. 136-139.

Use of carbide-tipped gun drills to achieve tolerances within a few ten-thousandths of the nominal hole diameter and finishes of 3 to 4 micro-inches on aluminum alloys and 4 micro-inches on cast iron, with an average of 7 to 7½ in production. Also time required for gun drilling of a multiple-step hole has reduced time required from 15 to 1½ min., and less skilled personnel are required.

20a-126. Precision Taps Flute-Sharpened for Close Tolerances. Stanley Lovejoy. *American Machinist,* v. 92, March 11, 1948, p. 133-135.

During the war much difficulty was encountered at General Electric in getting a reasonable amount of production from purchased taps for class three tolerance in the small fine-thread series sizes 0 to ¼ in. A study of the taps showed that they were well within specified tolerances for pitch diameter, outside diameter, lead, and chamfer angle. However, the shapes, sizes, and hook angles of the flutes varied greatly. This led to adoption of flute grinding for correct rakes. Development of a satisfactory procedure for the latter.

20a-127. Work Loaders Applied to Machine Tools. Rupert Le Grand. *American Machinist,* v. 92, March 11, 1948, p. 149-172.

Special report on a wide variety of applications, including boring, broaching, gear-cutting, grinding, honing, milling, threading, and turning machines.

20a-128. Practical Ideas. *American Machinist,* v. 92, March 11, 1948, p. 183-188.

Grinder mounted on shaper ram sharpens teeth of circular saw (John T. Zurlo); diagrams of four types of stud removers for close quarters (R. E. Trospect); production of 7-ft., 6-in. rack, in sections to be joined later, by use of shaper (U. Wheatley); points out difference in tool-point widths for production of a worm thread on mill and lathe, respectively (Edward J. Rantsch); use of adjustable steadyrest to eliminate taper in cylindrical-ground work (Allen B. Nixon); and other miscellaneous shop hints.

20a-129. Uses for Double-End Tool Boring. *American Machinist,* v. 92, March 11, 1948, p. 199, 201.

Various applications.

20a-130. Modern Cutting Tools and Machine Tool Design. C. Eatough. *Engineer,* v. 185, Jan. 9, 1948, p. 53; discussion, p. 52; Jan. 16, 1948, p. 75-77. Condensed from paper presented to Institution of Mechanical Engineers, Jan. 2, 1948.

Machine tool design and effects of differences in cutting tool shapes and dimensions on cutting speeds.

20a-131. Adjustable Flat Boring Cutters. G. R. Milner. *Machinery* (London), v. 72, Feb. 26, 1948, p. 276.

A double-cutting, edge-type flat tool was developed for finish boring long holes of 3½ in. diameter in steel castings, using a horizontal boring machine. The tool is provided with cemented carbide tips which are brazed onto a soft steel body.

20b—Ferrous

20b-21. Honing Diesel Cylinder Liners. E. D. Ball. *Machinery* (London), v. 72, Jan. 29, 1948, p. 131-134.

Special equipment used by British firm.

20b-22. New Techniques in Conditioning Stainless Steel. A. E. Hamilton, Jr. *Iron and Steel Engineer,* v. 25, Feb. 1948, p. 78-84; discussion, p. 85-87.

Use of new machines which have been developed for grinding slabs and strip. They offer possibilities for better quality and production at lower costs. (Presented at A.I.S.E. Annual Convention, Pittsburgh, Sept. 22, 1947.)

20b-23. Broaching Gasket Faces on Chevrolet Engine Blocks. *Iron Age,* v. 161, Feb. 19, 1948, p. 71.

More efficient method which replaced grinding.

20b-24. The Production of Oil-Engined Locomotives. *Machinery* (London), v. 72, Feb. 5, 1948, p. 167-174.

Methods used by British firm, mainly for machining.

20b-25. Cemented Carbide Milling Cutters and Their Applications. H. Eckersley. *Machinery* (London) v. 72, Feb. 5, 1948, p. 175-180, 192.

20b-26. Portable Gear-Tooth Grinder. *Railway Mechanical Engineer,* v. 122, March 1948, p. 82-83.

Equipment used primarily for removing shoulders on worn traction-motor ring gears at the West Burlington Diesel shop of the Chicago, Burlington & Quincy.

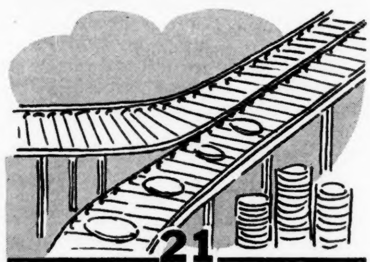
20b-27. Ingenious Tooling Cuts Sheave Costs. Carl Shank. *American Machinist,* v. 92, March 11, 1948, p. 178-181.

Taper-lock sheaves are made in 467 stock sizes by Dodge for various V-belt applications. Tooling arrangements for their economical production.

20b-28. The Manufacture of Injectors for High-Speed Oil Engines. *Machinery* (London), v. 72, Feb. 26, 1948, p. 267-272.

Methods used by British firm. Details of injector designs.

For additional annotations indexed in other sections, see:
8-42; 12b-19; 21a-49; 27a-35-41.



MISCELLANEOUS FABRICATION

21a—General

21a-33. Introduction to Plant Layout. Parts I and II. A. E. Rylander. *Tool Engineer,* v. 19, Jan. 1948, p. 17-24; v. 20, Feb. 1948, p. 31-36.

First of series discusses the subject in general terms. Second part describes, diagrams, and discusses the layout of a plant for the manufacture of insulated wire and cable, in order to illustrate the principles set forth in Part I. (To be continued.)

21a-34. Printed Circuit Techniques. Cledo Brunetti and Roger W. Curtis. *National Bureau of Standards, Circular 468,* Nov. 15, 1947, 43 pages.

Circuits are defined as being "printed" when they are produced on an insulated surface by any process. Methods fall in six main classifications: painting, chemical deposition, vacuum deposition, die-stamping, and dusting. Methods used up to the present have been painting, spraying, and die-stamping. Production details as well as precautions and limitations. Many applications and examples. 60 ref.

21a-36. British Coinage and Coinage Alloys. W. A. C. Newman. *Endeavour,* v. 7, Jan. 1948, p. 15-20.

Metallurgical problems in the manufacture and analysis of coins.

21a-37. Plastic Tooling Comes of Age. Part II. Lawrence Wittman. *Tool & Die Journal,* v. 13, Feb. 1948, p. 55-56, 58, 62, 64, 74-76.

Miscellaneous applications, methods of use, and design considerations.

21a-38. Plastic Tooling Strong, Inexpensive and Easy to Produce. Lawrence Wittman. *Materials & Methods,* v. 27, Feb. 1948, p. 87-92.

Use of laminated plastics for forming tools, assembly fixtures, checking fixtures, and many other types of tooling, with few limitations as to size, shape, and service conditions.

21a-39. Can You Spotlight Handling Wastes? *Modern Industry,* v. 15, Feb. 15, 1948, p. 40-45.

(Turn to page 48)

Corrosion Costs Include Large Sums For Preventive Steps

Reported by Frank Kristufek
U. S. Steel Corp. Research Laboratory

Corrosion costs this nation an estimated 3 to 4 billion dollars annually, according to Kenneth C. Compton of Bell Telephone Laboratories, who spoke on "Corrosion of Metals" at the January meeting of the New Jersey Chapter. A large portion of this sum is expended on preventive measures such as inhibitors and protective coatings.

Fundamentally, corrosion is an electrochemical phenomenon consisting of a transfer of electrons. Positively charged ions, usually hydrogen, in the corroding solution lose electrical charges which are acquired by the metal or alloy being corroded and thus a corroding current is created. When interference is presented to the flow of this current, polarization exists.

Most common of the various types is atmospheric corrosion, which represents the greatest destruction of metal on a tonnage basis, stated Mr. Compton. It is normally characterized by electrochemical reaction which proceeds uniformly over the entire exposed surface. A type generally encountered in chemical plants is galvanic corrosion in which two dissimilar metals, when exposed to an electrolyte such as ordinary water, actually become a weak battery, generating tiny electric currents which flow through the couple causing solution of the anodic metal. Moisture is essential in this type of corrosion and when the moisture contains dissolved salts, such as in sea water, galvanic action proceeds at an accelerated pace.

Inclusions Cause Corrosion

Electrochemical potentials may be created as a result of the formation of concentration cells in the material, such as inclusions. Consequently, structurally nonhomogeneous alloys are more susceptible to corrosion than pure metals or solid solution alloys. Likewise, inclusions and precipitation of compounds in the grain boundaries of a metal may result in localized attack or intergranular corrosion at the boundaries of the metallic crystals. The 18-8 stainless steels are particular susceptible to this type when improperly heat treated. Stress-corrosion is the result of lowered resistance in a material caused by internal stresses; it is often encountered in brass and may be either transcrystalline or intercrystalline in nature.

Several factors influencing the rate of corrosion, as discussed by Mr. Compton, are the character of the metal or alloy as determined by its chemical composition and heat treatment, temperature, and activity of the electrolyte.

Caution should be observed in analyzing the results of corrosion rate tests, emphasized the speaker in concluding, for unless such tests are numerous and broadly interpreted, they may prove misleading.

An excellent series of slides illustrating types of corrosion failures of ferrous and nonferrous materials was shown during the discussion and specimens exhibiting such failures were presented by Mr. Compton following his talk.

Detroit Has Officers' Night

Reported by R. M. McBride
Universal Products Co.

Detroit Chapter observed National Officers' Night on Feb. 9. Although Secretary Eisenman could not be present, the services of A. L. Boegehold, a past president of A.S.M., as technical chairman of the meeting, made it a real Officers' Night.

F. B. Foley, president of A.S.M., spoke on "Ferrous Metals for Elevated-Temperature Service". The choice of subject proved a happy one as attested by the good attendance and many questions posed in the discussion period following the lecture. Considerable attention was given compositions and conditions producing the sigma phase as well as properties and applications.

A. R. Stevenson Represents Mid-West Forge in Detroit

A. R. Stevenson

A. R. Stevenson, formerly metallurgist and sales engineer for Tube Turns, Inc., Louisville, Ky., is now representing Mid-West Forge Co. of Cleveland in the Detroit district. Mr. Stevenson is a graduate of Ohio State University with degrees of Bachelor of Metallurgical Engineering and Master of Science in Metallurgy (1932).

In 1933 he joined Republic Steel Corp. in the Massillon district, working first in the mill and later as field metallurgist. From 1936 to 1944 he was field metallurgist for Carnegie-Illinois Steel Corp., joining the Tube Turns organization in 1944.

Gives tips, largely for the metal-working industries.

21a-40. Automatic Assembly of Pistons and Connecting Rods. *Automotive Industries,* v. 98, Feb. 15, 1948, p. 28.
Machine introduced by Ford Motor Co.

21a-41. Highlights of Monobilt Body Production. Joseph Geschelin. *Automotive Industries,* v. 98, Feb. 15, 1948, p. 30-31, 60.
Advanced materials handling methods used by Hudson in new plant layout.

21a-42. Mechanized Handling Eases Wheel Manufacture. Harry S. Wharen. *American Machinist,* v. 92, Feb. 26, 1948, p. 84-88.
Press-line layout for automobile-wheel manufacture. Diagrams and descriptions of forming tools and dies.

21a-43. Handling Materials in the Foundry Yard. Robert H. Herrmann. *Foundry,* v. 76, March 1948, p. 70-77.

21a-44. Notched Skid Bins Solve Crankshaft Handling Problem. *Iron Age,* v. 161, March 11, 1948, p. 130.
Substantial savings in handling crankshafts and other odd-shaped machine parts both in process and storage have been realized by notching of skid bins to hold the pieces solidly in place.

21a-45. Speeding Up Assembly Operations. *Machinery* (London), v. 72, Feb. 12, 1948, p. 217-222, 229.
Methods used at Lockheed Hydraulic Brake Co., Ltd., Leamington Spa, England, for hydraulic braking systems.

21a-46. Modern Methods; the Key to Western Industrial Success. E. L. Mathy. *Western Metals,* v. 6, Feb. 1948, p. 15-18.
A few examples of results achieved by better tools and progressive planning in mass-production fabrication.

21a-47. Straightline Magneto Production Affords Increased Product Quantity and Quality. Dan Reebel. *Steel,* v. 122, March 15, 1948, p. 96-100.
Methods used at Jack & Heintz, Cleveland.

21a-48. Modern Materials Handling and Processing Methods Boost Output at Westinghouse Buffalo Plant. *Machine and Tool Blue Book,* v. 44, March 1948, p. 141-148, 150, 152-154.
Production of squirrel-cage induction motors. Emphasized are materials handling, assembly, machining, welding, and coil winding.

21a-49. Ingenious Tooling and New Machine Tools Achieve High Rate of Production at Victor Equipment Co. Gerald E. Stedman. *Machine and Tool Blue Book,* v. 44, March 1948, p. 157-158, 160, 162, 164, 166, 168.
A special metal-twisting machine is among the special machines designed by Victor to raise production of welding and cutting equipment. Another interesting application is the use of special vacuum chucks.

21a-50. Planning for Plant Layout. A. E. Rylander. *Tool Engineer,* v. 20, March 1948, p. 41-46.
Concluding installment supplements the previous ones with a typical case study.

21b—Ferrous

21b-14. Kalamazoo Stove and Furnace Company; a Modern Range Producing Plant. *Better Enameling,* v. 19, Feb. 1948, p. 8-15.
Fabrication, enameling, and materials-handling procedures and equipment.

21b-15. Steel and Your Sewing Machine. James H. McCormick. *Du Pont Magazine,* v. 42, Feb. 1948, p. 6-8.
Production of sewing-machine parts, with emphasis on casehardening.

21b-16. California Warms the Country. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 86-89, 122.
Production of forced-draft electric heaters. Includes welding, finishing, stamping, shearing, and assembly operations.

21b-17. Yoke and Pole Pieces for Cyclotron Magnet. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 170.
Production from ingots to finished product. The yoke is 33 ft. long, 21 ft. high, and 14 ft., 2 in. wide, with a window 22 ft., 6 in. by 10 ft., 6 in., in which are placed the upper and lower pole pieces of the magnet. It is built up of heavy forged steel plates bolted together. Total weight of the cyclotron magnet is approximately 2000 tons.

21b-18. Air Conditioning Cuts Rust Spoilage. Nathan N. Wolpert. *Heating and Ventilating,* v. 45, Feb. 1948, p. 81-82.
Production of ball bearings to extremely close tolerances and exact quality control, largely made possible by use of air conditioning at S.K.F. Industries, Inc.

21b-19. Fabricating Automobile Molding Clips. Herbert Chase. *Iron Age,* v. 161, Feb. 19, 1948, p. 74-77.
For faster and better appearing installation of stainless molding trim on automobiles, Buick has developed an elliptical clip to which a stud is attached for assembly to panels. Production of this assembly which utilizes a progressive die with a dial arrangement for fastening or staking the screw to the stamping.

21b-20. Hypodermic Tubing Production. *Machinery* (London), v. 72, Jan. 29, 1948, p. 139. Based on B.I.O.S. Report No. 1428.
Methods used by German firm using Ni-Cr steel.

21b-21. Overhead Handling System Speeds Foundry Operations. Francis A. Westbrook. *Foundry,* v. 76, March 1948, p. 218-219.

21b-22. Improved Tooling Boosts Output at Nash-Kelvinator Plant. Seward N. Lawson. *Production Engineering & Management,* v. 21, March 1948, p. 53-56.
Use of transfer-type line-production and special-purpose machines in the retooling of production lines for manufacture of refrigeration equipment. Includes use of welding.

21b-23. Steel for Shaves. *Business Week,* March 13, 1948, p. 44, 46.
Economics and technology of razor-blade manufacture.

21b-24. Planned Tooling Whittles Costs. Harry S. Wharen. *American Machinist,* v. 92, March 11, 1948, p. 140-143.
Use for miscellaneous fabrication operations at Douglas Aircraft.

21b-25. The Handling of Sheet Steel. Russell L. Franing. *Finish,* v. 5, March 1948, p. 21, 64.
Materials-handling procedures used by International Harvester Co., East Moline, Ill.

21b-26. Production of Hussmann Refrigerators and Refrigerator Equipment. Ralph M. Grueber. *Modern Industrial Press,* v. 10, March 1948, p. 42, 44, 52.
Various fabrication operations, including press operations, welding, metal cleaning, enameling, and materials handling.

21b-27. Tin Plate "Doubling" in Can Fabricating Eliminated by Simple Magnet. *Steel,* v. 122, March 22, 1948, p. 106.
Air-blast separation used in the past frequently failed to separate the sheets, and doubles were fed into coating units and can-fabricating machinery. This sometimes caused cracked dies and more often required time-consuming manual separation and refeeding. Use of magnetic preseparator eliminated the difficulty.

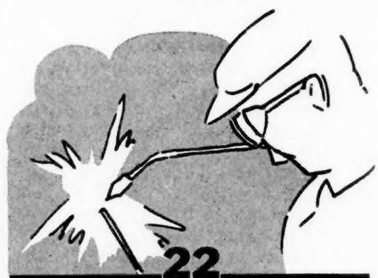
21b-28. German Methods in Developing Turbine-Wheel Blades for the Jumo-004. Heinrich K. O. Adenstedt. *Technical Data Digest,* v. 13, March 15, 1948, p. 7-13.
The wheel was about 27½ in. in diameter and had 61 blades 4.33 in. in length attached to it by two riveted pins. Compositions of different steels tried, various production and service difficulties encountered, method used for temperature measurement of disk surfaces, and final specifications adopted for control of melting and forging procedures and for inspection and testing of the completed wheels.

21c—Nonferrous

21c-3. Brass Smelting Speeded by New Materials Handling Methods. *Steel,* v. 122, March 1, 1948, p. 100.

21c-4. Precision Method of Fabricating Makes Heavy-Duty Gridded Bearings Available at Lower Cost. *Steel,* v. 122, March 15, 1948, p. 128.
Simple method developed by National Bearing Division, American Brake Shoe Co., St. Louis.

For additional annotations indexed in other sections, see: 7b-38.



22 JOINING and FLAME CUTTING

22a—General

22a-48. Use of Redux Adhesives for Bonding Metal. M. Martin. *U. S. Atomic Energy Commission,* MDDC-1166. May 20, 1947, 2 pages.
Methods for use of above thermosetting synthetic resins and results obtained.

22a-49. Sealing of Metals to Ceramics With Particular Reference to Glass, 1935-1939. *Science Museum Library,* South Kensington, London, No. 520, 7 pages.
An unannotated bibliography. 116 ref.

22a-50. Electric Resistance Welding; a Bibliography of the Literature From January, 1936 to June, 1947, With Index and Topical Synopses. Harold S. Card. *The Author,* Cleveland, 1947, 22 pages.

22a-51. Arc Welding and Resistance Welding. P. J. Rieppel. *Metals Review,* v. 21, Feb. 1948, p. 5-7, 9.
A review of recent literature with references to A.S.M.'s "Review of Current Metal Literature."

22a-52. New Welding Equipment. *Metals Review,* v. 21, Feb. 1948, p. 11, 13, 15, 17, 19.
Reviews 127 new products and processes announced by manufacturers during past six months.

22a-53. Use of Conduction Heating for Soldering Brass Without Discolora-

(Turn to page 50)

Recent Advances in Various Metallurgical Fields Outlined

Reported by J. W. Sweet
Chief Metallurgist, Boeing Aircraft Co.

High-temperature alloys, welding metallurgy and tin plating are some of the fields of metallurgy in which recent advances have taken place that ere described by G. L. von Planck, chief metallurgist of Columbia Steel Co., San Francisco, before the Puget Sound Chapter A.S.M. at the February meeting.

By adjustments in chemical composition of some of the high-temperature alloys, the difficulties encountered in rolling and forging have been considerably reduced. Precision casting by the lost-wax process has proved to be a decided advantage where other means have been found impractical. Powder metallurgy has shown real promise in this field and has proven its worth in other fields such as the production of bushings, bearings, gears, pinions and similar parts.

Cites Ship Welding Research

Turning to advances in welding metallurgy, Mr. von Planck spoke of the lessons learned in the design of welded ships by research into causes of failure of a few of these ships in service. The importance of the transition temperature from shear fracture to cleavage fracture in notch-impact and tensile testing as applied to principles of ship construction was pointed out. Rimmed steel has the highest transition temperature (which may be as high as room temperature on very heavy plates), followed by a semi-killed steel, silicon-killed steel, and aluminum-killed steel.

Some consideration was given at one time to changing the type of steel used for ship construction from semikilled to a fully killed steel, but the decreased production that would result made this step impractical. Some changes in design, together with improved welding techniques, have practically eliminated those conditions under which the higher transition temperature of semikilled steels could cause any difficulty.

In tin plating, said Mr. von Planck, research has resulted in control of both plating and the steel base which has largely reduced chances of spoilage in canned foods. The development of very thin coatings for use on containers such as coffee cans has resulted in considerable saving.

In conclusion, Mr. von Planck touched on a number of other interesting developments. Much progress has been made in the field of enameling steels; strong deoxidizers have been tried with success for the control of blistering, and lower temperature enamels have reduced warpage of baked parts.

Stainless-clad steels are being more widely used, and Stainless W, a new precipitation hardening alloy, has shown some interesting high-strength properties.

The continuous galvanizing of steel sheet of various thicknesses which is bonded strongly enough to withstand severe forming operations is another achievement.

Philadelphia Hears Zapffe's Theory of Gases in Metal

Reported by H. J. Godfrey
Assistant Chief Development Engineer John Roebling's Sons Co.

Carl A. Zapffe's now famous lecture on "Gases in Metals" was heard by the Philadelphia Chapter A.S.M. on Jan. 30. Dr. Zapffe was introduced by C. A. Turner, program chairman, and presented his theory of gases and their effect on metal behavior in an interesting and entertaining manner.

Discussing oxygen, Dr. Zapffe presented evidence for the formation of protoxides, which dissociate on cooling, throwing out a metal constituent.

Dr. Zapffe's data on hydrogen embrittlement of steel supported the microcrack theory of metals. He clearly demonstrated the effect of plastic deformation on the release of molecular hydrogen. Vapor pressure of atomic hydrogen, he said, is the direct control in embrittlement, having a potential of thousands of atmospheres of molecular hydrogen. From this one can understand why the properties of steel are affected by the presence of moisture during the steelmaking process, and why cold steel picks up so much hydrogen from pickling and electroplating.

Prior to Dr. Zapffe's lecture, the motion picture "Metal Crystals" was shown. National President Francis Foley and Bradley Stoughton, a past president, were among those present at the meeting.

Alcoa Names Three Asst. Research Chiefs

Promotion of G. R. GARDNER, H. Y. HUNSICKER and W. E. SICHA by Aluminum Co. of America brings to four the number of assistant chiefs of the Cleveland research division. The division is headed by KENT R. VAN HORN, a past president of A.S.M.; M. W. DAUGHERTY was appointed an assistant chief in 1945.

Mr. Hunsicker became associated with the Cleveland research division in 1936 and directs permanent mold casting research. He developed the aluminum-tin bearing alloys and has conceived important process techniques for permanent mold casting. He was chairman of the Cleveland Chapter A.S.M. in 1946-47.

W. E. Sicha, also an active Cleveland A.S.M. member, joined the Alcoa staff in 1928 and came to the research division in 1943 in charge of sand casting research. He has contributed materially to development of aluminum casting alloys, improvements in casting processes, and foundry test methods.

Mr. Gardner has been responsible for the organization of an entirely new department concerned with sands and mold and core materials. He is active in the American Foundrymen's Association.

Foley Speaks in New York

Francis B. Foley (Left) Spoke on "Behavior of Metals Under Stress at Elevated Temperatures" at National Officers Night of the New York Chapter A.S.M. At right is Douglas E. Boyd of Joseph T. Ryerson & Son, Inc., chairman of the chapter. (Reported by Birger L. Johnson, Jr.)

tion. *Industrial Heating,* v. 15, Feb. 1948, p. 246, 248.

Ingenious method of providing localized heat for soldering operations. The method involving conduction heating has the advantages of induction heating and is achieved at a very low cost.

22a-54. 275 Welded Tanks Per Day at Eaton. Gerald Eldridge Stedman. *Welding Engineer,* v. 33, March 1948, p. 33-35.

Production methods using ingenious fixtures.

22a-55. Fixtures for Automatic Torch Brazing. W. E. Johnson and H. A. Huff. *Welding Engineer,* v. 33, March 1948, p. 42-43.

A conveyer belt and a turntable method for increasing production of various assemblies.

22a-56. Sheet Metal to Switchboards. Fred M. Burt. *Welding Engineer,* v. 33, March 1948, p. 46-48.

Describes and illustrates spot welding for small parts and arc welding for large assemblies.

22a-57. That Problem of Power Factor. John H. Blankenbuehler. *Welding Engineer,* v. 33, March 1948, p. 58-60.

Defines power factor and tells how to reduce it when welding load is involved.

22a-58. Hard Facing by Metal Spraying. *Welding Engineer,* v. 33, March 1948, p. 62, 64.

"Sprayweld"—a new process developed to apply thin layers of hard facing to a base metal.

22a-59. The Story of the Welding Symbols. Leon C. Bibber. *Welding Journal,* v. 27, Feb. 1948, p. 101-107.

The development of welding symbols over the past 20 years. The purpose of A. W. S. symbols and how they may be used.

22a-60. Mechanized Inert-Gas Shielded-Arc Welding. H. T. Herbst. *Welding Journal,* v. 27, Feb. 1948, p. 111-117.

Applications and methods. (Presented at 28th Annual Meeting, A. W. S., Chicago, week of Oct. 19, 1947.)

22a-61. Standardized Welded Beam Connections and Special Rigid Frame Details of New Airco Laboratory. La-Motte Grover. *Welding Journal,* v. 27, Feb. 1948, p. 130-135.

Use in construction of Air Reduction's new laboratory at Murray Hill, N. J. Welding details are based on "Manual of Design for Arc-Welded Steel Structures", compiled by the writer and published in 1946 by Air Reduction Co. (Presented at 28th Annual Meeting, A. W. S., Chicago, week of Oct. 19, 1947.)

22a-62. Rigid Structures. Martin P. Korn. *Welding Journal,* v. 27, Feb. 1948, p. 135.

A discussion of the use of the phrase "all-welded rigid design".

22a-63. Volume Output With Heliarc Welding. *Production Engineering & Management,* v. 21, March 1948, p. 56.

Outlines the process and its advantages in general terms and illustrates it with a specific example.

22a-64. Furnace Fixture for Maintaining Welding Preheat. W. R. Patterson. *Iron Age,* v. 161, March 11, 1948, p. 141-142.

Present day welding requirements often make it necessary to weld complicated parts using materials that are sensitive to hardening. The adjustable articulated electric welding furnace was developed to overcome some of the difficulties associated with such work. While it was designed primarily to handle a specific item, the principles involved apply to many other welding jobs.

22a-65. The Physics of Arc Welding. *Engineering,* v. 165, Jan. 9, 1948, p. 38. Condensed from Technical Report, Reference Z/T61. "The Transfer of Material, Temperature and Stability in the Electric Welding Arc. A Résumé of Published Information", British Electrical and Allied Industries Research Assoc., 15 Savoy-Street, London, W.C.2.

22a-66. A Survey of Established Processes for the Jointing of Metals. D. F. Hewitt. *Sheet Metal Industries,* v. 25, Feb. 1948, p. 363-366, 372.

First of a series in which principles and practical details of the various processes now in common use will be discussed. (To be continued.)

22a-67. Rapid Wetting Test for Solders. *Bell Laboratories Record,* v. 26, Feb. 1948, p. 63.

Twisted pairs of wires are immersed vertically in a bath of molten solder and the height of capillary rise between the wires in 15 sec. is observed. This height depends on temperature and composition of the alloy, diameter and thermal conductivity of the wires, their twist and cleanliness, nature of the flux, and time of immersion. By maintaining other factors constant, variation in wettability as a function of any one factor can be readily determined.

22a-68. Here's How York Does It. Albert Anderson and Eli Anderson. *Industry and Welding,* v. 21, March 1948, p. 26-29, 57-58, 60.

How procedure data is developed and transmitted to welding departments. Applications on silicon bronze, Cu-Ni, stainless, and carbon steel. Procedures are given for brazing, inert-arc, and resistance welding, plus grinding and polishing. Emphasis is given to use of positioning equipment, rotating fixtures, and quick acting clamps in the manufacture of industrial refrigeration and air-conditioning equipment.

22a-69. Saving Money on Tools and Fixtures. Part II. E. H. Girardot and D. W. Puffer. *Industry and Welding,* v. 21, March 1948, p. 30-32, 34.

Tools fabricated by the "composite" method at G. E., including those with hardening and machining done prior to welding, and those completely assembled before machining.

22a-70. Designing for Resistance Welding. Ernie Lauter. *Industry and Welding,* v. 21, March 1948, p. 90-92.

Seam welding consisting of making a series of spot welds by means of one or two rotating-wheel electrodes without opening the wheels between spots.

22a-71. Standard Annular Ring Projection for Resistance Welding. O. C. Frederick. *Steel Processing,* v. 34, Feb. 1948, p. 88-89, 96.

Recommended designs and preferred dimensions.

22a-72. Welding and Fabrication of High-Temperature Alloys. C. G. Chisholm. *Welding Journal,* v. 27, March 1948, p. 217-223.

Welding processes and techniques applied to several superalloys in the manufacture of parts for gas turbine rotors, jet nozzles, and combustion chambers. (Presented at 28th annual meeting, A. W. S., Chicago, week of Oct. 19, 1947.)

22a-73. French Specifications for Gas Welding Rods. *Welding Journal,* v. 27, March 1948, p. 223-224.

Condensed from specifications issued by French Committee on Standardization of Welding, Sept. 1947.

22a-74. Shape Welding by the Submerged Melt Welding Process. J. A. Kratz. *Steel Processing,* v. 34, March 1948, p. 141-143, 146-147.

Previously abstracted from *Welding Journal,* v. 27, Jan. 1948, p. 5-10. See item 22a-30.

22b—Ferrous

22b-64. Twelve and Thirteen-Ton Wagon Frames Fabricated by Arc Welding. *Welder,* v. 16, Oct.-Dec. 1947, p. 76-77.

"Wagons" are British freight cars.

22b-65. Welding on the Railways (Civil Engineering). W. K. Wallace. *Welder,* v. 16, Oct.-Dec. 1947, p. 78-81.

22b-66. Welding at the Doncaster Works of the L.N.E.R. *Welder,* v. 16, Oct.-Dec. 1947, p. 82-86.

Work at British railway shop.

22b-67. Prefabricated Experimental Unit Stations on the L.M.S. *Welder,* v. 16, Oct.-Dec. 1947, p. 87-88.

Welded construction at British railway stations.

22b-68. The Fabrication of Tank Locomotives by Arc Welding. *Welder,* v. 16, Oct.-Dec. 1947, p. 88-90.

22b-69. "Merchant Navy" Class Locomotives. *Welder,* v. 16, Oct.-Dec. 1947, p. 91-93.

Welding fabrication procedures.

22b-70. Some Applications of Electric-Arc Welding at Swindon. *Welder,* v. 16, Oct.-Dec. 1947, p. 94-95.

At locomotive shops of a British railway.

22b-71. Pouvoir Trempant et Soudabilité Métallurgique des Aciers. (Hardenability and Metallurgical Weldability of Steels.) H. Granjon. *Soudure et Techniques Connexes,* v. 1, Nov.-Dec. 1947, p. 230-242.

Defines weldability and hardenability and outlines properties important in weldability testing. Uses made of the hardenability study and how it contributes to knowledge of weldability of steels. 18 ref.

22b-72. Réparation d 'un Pot de Presse Hydraulique de 2500 Tonnes. (Repair of the Cylinder in a 2500-Ton Hydraulic Press.) J. Coche. *Soudure et Techniques Connexes,* v. 1, Nov.-Dec. 1947, p. 243-246.

Welding processes used in repairing press.

22b-73. La Soudure a l'Arc Sous-Marine dans les Travaux de Renflouage du S. S. "Patrai", Cargo de 2800 Tonnes. (Underwater Arc Welding in the Job of Refloating the S. S. Patrai, a 2800-Ton Cargo Vessel.) A. Bartoux. *Soudure et Techniques Connexes,* v. 1, Nov.-Dec. 1947, p. 246-259.

22b-74. Arc Welding of Cast Iron. T. E. Kihlgren and L. C. Minard. *American Foundrymen's Assoc., Preprint No.* 47-54, 1947, 10 pages.

General considerations involved in the arc welding of cast iron with nickel electrodes. Effects of such variables as preheat, superimposition of beads in multipass welds and bead sequence on properties of welded cast iron. A preliminary torch "degassing" procedure is described for improving the welding response of castings containing dissolved gas. Field applications.

22b-75. Silver Brazing Threadless Malleable Fittings. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 98-100.

Procedures which were introduced by Stanley G. Flagg & Co., and their applications and advantages over threaded joints.

22b-76. Welding Petcock Wrenches on Simple Machine Speeds Process. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 162.

22b-77. Preheating for Welding Is Heat Treatment. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 162, 164.

22b-78. Metallurgical Properties of High Yield Strength Seamless Line Pipe. A. B. Wilder and J. D. Tyson. *Petroleum Engineer,* v. 19, Feb. 1948, p. 138, 141, 144, 146, 148, 150, 152.

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Costly Single Parts Call Upon Ingenuity Of Heat Treater

Reported by Louis Malpoker
Lincoln Engineering Co.

"Heat Treating Hints", a movie by Lindberg Engineering Co., vividly prefaced a talk on "Practical Problems in Commercial Heat Treating" before the St. Louis Chapter A.S.M. on Feb. 20. Edward J. Pavesic, chief metallurgist, Lindberg Steel Treating Co., was the guest speaker.

The problems encountered by commercial heat treaters are numerous, Mr. Pavesic said. Although large production runs offer little trouble when parts are processed from a single heat of steel of uniform analysis, and physical condition before heat treatment is uniform, it is a different story when rigid specifications and improper selection of material require the heat treater to exercise his ingenuity.

Single components of machine or structural parts, tools and dies offer the greatest problem to commercial steel treaters, since there can be no experimenting to determine the proper method of heat treatment. Some of the factors which must be correlated in heat treating these costly items were listed as follows:

1. Chemical analysis
2. Physical condition of raw materials
3. Defects
4. Conditioning treatments
5. Degree of correlation between design and analysis of material used
6. Dimensional tolerances
7. Furnaces and atmospheres
8. Time and temperature control
9. Quenching media
10. Tempering practice
11. Straightening practice

According to Mr. Pavesic, the steelmaker, the consumer and the designer can bring untold griefs upon the heat treater by improper application of material or improper design. His job is complicated by the fact that he is working with the material in a plastic condition and in subsequent hardening it undergoes severe thermal and transformation stresses. The heat treater is quite often called upon to correct errors of commission and omission initiated by the manufacturer of the machine part or tool, and his problems are greatly reduced by proper cooperation between the steel manufacturer, the steel consumer and the heat treater.

Tatnall Speaks at Ontario

Reported by W. R. Jackson
Carboloy Div., General Electric Co., Ltd.

Francis G. Tatnall of the Baldwin Locomotive Works combined humor and information in his address to the members of the Ontario Chapter at the January meeting in Toronto. Mr. Tatnall's subject was "Physical Testing up to Date and Simplified". It has been reported in previous issues of *Metals Review*. Technical Chairman H. Thomasson of Canadian Westinghouse introduced the speaker.

Talks on Furnace Atmospheres

Reported by C. G. Atchinson
Assistant Chief Metallurgist
Sheffield Steel Corp.

Use of radiant tubes has relieved the furnace designer from the limitations in cross section and conveyor systems, W. O. Owen of the Surface Combustion Corp. pointed out in addressing the February meeting of the Kansas City Chapter A.S.M. on "Atmospheres and Furnaces".

Various types of endothermic and exothermic machines for producing the necessary atmospheres for the prevention of oxidation and decarburization were described. Mr. Owen especially stressed the fundamental requirements necessary in the atmosphere to produce controlled carbon pressures for skin recovery.

Previously abstracted from *Welding Journal*, v. 26, Oct. 1947, p. 872-880. See item 3-344, R.M.L., v. 4, 1947.

22b-79. Tooling and Operations in Vending Machine Making. *Sheet Metal Worker*, v. 39, Feb. 1948, p. 53-55.

Includes several types of welding and complicated jigs as well as press operations.

22b-80. Ore Bridge Made From Welded Assemblies. Thomas M. Fallon. *Welding Engineer*, v. 33, March 1948, p. 44-45.

Welded construction was found to have many advantages for a giant traveling ore bridge, capable of handling up to 900 tons of ore per hour.

22b-81. A.W.S. Electrode Classifications. Part II—E-6013 and Flat-Position Electrodes. *Welding Engineer*, v. 33, March 1948, p. 67.

An engineering data sheet.

22b-82. Tests of Various Designs of Welded Hatch Corners for Ships. E. Paul DeGarmo. *Welding Journal*, v. 27, Feb. 1948, p. 50s-68s; discussion, p. 69s-70s.

Results of tests on ten full-scale welded hatch corners to determine the effectiveness of various modifications used on "Liberty" ships. In addition, three new designs were investigated. A design similar to the hatch corners on early Liberty ships was used as basis for comparison. (Presented at 28th Annual Meeting, American Welding Society, Chicago, week of Oct. 19, 1947.)

22b-83. Proposed Specification for Steel St.L.37 for Welded Bridge Construction. P. Schoonmaker and Others. *Welding Journal*, v. 27, Feb. 1948, p. 117. Translated from *Laschtechnick*, v. 13, Oct. 1947, p. 93-94.

Tests proposed by a committee of the Netherlands Welding Society in which allowable design stress is same in weld as in base metal.

22b-84. The Uses of Flux-Injection Cutting for Stainless Steels. G. E. Bellew. *Welding Journal*, v. 27, Feb. 1948, p. 118-124.

The use of a flux feeder unit in which a chemical flux is used to permit fluid slagging of refractory oxides. (Presented at 28th Annual Meeting, American Welding Society, Chicago, week of Oct. 19, 1947.)

22b-85. Threadless Fittings. *Welding Journal*, v. 27, Feb. 1948, p. 156.

Flagg-Flow socket-type fitting for brazing to steel or wrought iron.

22b-86. The Work of the Ship Structures Committee. Ellis Reed-Hill. *Welding Journal*, v. 27, Feb. 1948, p. 33s-34s.

Introductory remarks. (Presented at Ship Structure Research Session Annual Meeting, American Welding Society, Chicago, week of Oct. 19, 1947.)

22b-87. The Effect of Temperature and Welding Conditions on the Strength of Large Welded Tubes. G. E. Troxell, E. R. Parker, H. E. Davis and A. Boodberg. *Welding Journal*, v. 27, Feb. 1948, 34s-49s; discussion, p. 49s, 70s.

Methods and results of tests on 12 welded 20-in. diameter by 10-ft. long tubes made of hull-quality steel. Results of various supplementary tests made to study fracture phenomena observed during tube tests.

22b-88. Hard Surfaced Bits Used on Oil Shale. *Engineering and Mining Journal*, v. 149, March 1948, p. 94.

Method of surfacing.

22b-89. Submerged Melt Welding of Hardenable Steels. E. A. Clapp and E. L. Frost. *Steel Processing*, v. 34, Feb. 1948, p. 80-83.

Previously abstracted from *Welding Journal*, v. 26, Dec. 1947, p. 1079-1082. See item 22-764, R.M.L., v. 4, 1947.

22b-90. The Metallurgical Aspects of Fusion Welding in Relation to the Weldability of Steels. (Continued.) H. Granjon. *Sheet Metal Industries*, v. 25, Feb. 1948, p. 367-371.

The thermal cycle in welding, including methods for investigating it and its typical features. (To be continued.)

22b-91. Design and Construction of Arc Welded Steam Platens. H. O. Lehman. *Rubber Age*, v. 62, Feb. 1948, p. 545-546.

Platens are those used on hydraulic presses for molding or curing of rubber, plastic, and plywood products. Substantial savings in fabrication cost over other methods are demonstrated. (This study won an award in the recent James F. Lincoln Arc Welding Foundation's Design-for-Progress Award Program.)

22b-92. Continuous Welded Rail. I. H. Schram and Others. *American Railway Engineering Association, Bulletin*, v. 49, Feb. 1948, p. 404-405.

Tables showing number of installations, removals, and renewals for each type of welding; and also the number of failures which occurred.

22b-93. Metallurgical Aspects of Carbon Steel Spot Welding. J. Heuschkel. *Steel*, v. 122, March 15, 1948, p. 93-95, 124, 126, 128; March 22, 1948, p. 67-69, 104, 106, 109.

Previously abstracted from *Welding Journal*, v. 26, Oct. 1947, p. 560s-582s. See R.M.L., v. 4, 1947, item 22-647.

22b-94. Powder Cutting as a Production Tool. D. H. Fleming. *Welding Journal*, v. 27, March 1948, p. 181-187.

Application to stainless steel. The process consists of introducing a finely divided iron-rich powder into the cutting-oxygen stream. The powder unites with oxygen and burns, liberating large quantities of heat and forming superheated molten particles of iron oxide. (Presented at 28th annual meeting, A.W.S., Chicago, week of Oct. 19, 1947.)

22b-95. Oxy-Acetylene Production Cutting in Steel Mills. A. H. Yoch and W. Begerow. *Welding Journal*, v. 27, March 1948, p. 188-192.

Advantages of mechanized oxy-acetylene cutting, reviewing briefly cold cutting, billet nicking, and revealing new advances in hot cutting which make possible faster cutting with less skill. (Presented at 28th annual meeting, A.W.S., Chicago, week of Oct. 19, 1947.)

22b-96. Extent of Peening Weld Deposits for Stress Relief. Joe Lawrence Morris. *Welding Journal*, v. 27, March 1948, p. 148s-158s.

Tests to determine how much of a weld deposit should be worked with a peening tool to obtain stress relief in the joint, maintain dimensions in the over-all structure, and correct distortion. Analyzes known variables involved in such a procedure. 66 ref.

22b-97. A Fabricated Heavy Plate Bending Machine. *Engineer*, v. 185, Feb. 27, 1948, p. 214-215. Condensed from paper by H. B. Fergusson and others for James F. Lincoln Arc Welding Foundation contest.

British-made machine for use in cold bending of plates up to 3½ in. and hot bending up to 5 in. thick, to 2/3 of a circle.

22b-98. New High-Alloy Hard Facing Materials Adapted to Automatic Arc Welding. *Materials & Methods*, v. 27, March 1948, p. 78-79.

Compositions, properties, and applications of eight new hard facing materials developed by Stoody Co. Flexible tubular weld rod applicable to automatic arc welding.

22b-99. The Stainless Steels. Part V. Welding of the Stainless Steel Compositions. Lester F. Spencer. *Steel Processing*, v. 34, March 1948, p. 127-133, 153, 156-157.

(To be continued.)

22c—Nonferrous

22c-6. Silicon Bronze Welding Problems Overcome Through Inert-Arc Method. Peter J. Gurklis. *Materials & Methods*, v. 27, Feb. 1948, p. 66-69.

Presence of humid atmosphere has been a source of excessive porosity when using the carbon-arc method. The welding of a bronze containing 96% Cu, 3% Si, and 1% Mn was investigated using carbon-arc; shielded metallic-arc; and inert-gas shielded-arc welding—the latter with helium, argon, and nitrogen. The welds were radiographed and tested mechanically.

22c-7. Arc Welding Copper Vessels. J. J. Vreeland. *Welding Journal*, v. 27, Feb. 1948, p. 125-129.

Carbon-arc method. Illustrations indicate that deoxidized copper can be satisfactorily arc welded. (Presented at 28th Annual Meeting, A.W.S. Chicago, week of Oct. 19, 1947.)

22c-8. Production Methods of Low-Temperature Silver Alloy Brazing. A. M. Setapen. *Welding Journal*, v. 27, Feb. 1948, p. 136-139.

Various applications. Discussion of heating methods. (Paper presented before 47th Annual Convention of the International Acetylene Assoc., Cincinnati, May 20-21, 1947.

22d—Light Metals

22d-7. Macroscopic Examination of Spot Welds in Aluminum. Gerard H. Boss. *Metal Progress*, v. 53, Feb. 1948, p. 227-230.

Part I of an extended survey of wartime developments in the spot welding of aluminum alloys.

22d-8. Welding Aluminum. *Sheet Metal Worker*, v. 39, Feb. 1948, p. 56-58.

A few suggestions for improving welded joint formulation in this metal.

22d-9. Arc Welding of Aluminum and Its Alloys. A. Schärer. *Light Metals*, v. 11, Feb. 1948, p. 77-81. Translated from doctorate thesis based on work in the research laboratories of the Aluminium Industrie—A. G. Neuhausen (Switzerland) under the guidance of A. von Zeerleder.

Various methods are reviewed briefly and gas welding is described in detail, including a method for temperature control of the preheated Al sheets by use of "Thermindex" colors. The atomic hydrogen process. (To be continued.)

22d-10. Welding the Light Alloys. Part I. *Light Metals*, v. 11, Feb. 1948, p. 89-95.

First of a series of four articles discusses importance of adequate training and outlines techniques to be described in later installments. (To be continued.)

22d-11. A Note on Soldering Aluminum. Louis D. Statham. *Review of Scientific Instruments*, v. 19, Feb. 1948, p. 116.

Recommends copper plating prior to soldering.

22d-12. The Pressure Welding of Light Alloy Bar Without Fusion. (Concluded.) R. F. Tylecote. *Sheet Metal Industries*, v. 25, Feb. 1948, p. 373-374, 376.

Concludes presentation of results of investigation of the oxy-acetylene welding of a series of Al and Mg alloys. Process is feasible for all of the alloys, but especially for the non-heat treatable Al-Mn and Al, 7% Mg alloys, and for large areas and moderate thicknesses.

(Turn to page 54)

Importance of Proper Electrode Choice Emphasized in Talk on Fusion Welding

Reported by J. T. O'Connor
Firestone Steel Products Co.

Speaking on "Fusion Welding of Metals" before the Akron Chapter A.S.M. on Feb. 11, C. H. Jennings, welding department engineering manager for Westinghouse Electric Corp., Buffalo, N. Y., discussed the basic fundamentals of pressure and nonpressure welding.

In the field of nonpressure welding, Mr. Jennings pointed out that carbon-arc welding, because of the danger from contamination by air, is not a widely used method. Metal-arc welding has grown tremendously in the past 20 years from the days of the bare electrode weld, inferior in ductility and soundness. The coated electrodes so widely used today give higher welding speeds and superior weld qualities.

Electrode coatings can be varied in composition to alter such factors as speed of welding, ease of arc striking and its stabilization, oxide removal, and alloy composition of the weld itself, thus altering the physical properties of the weld. Because there is molten metal from both the electrode and the base material, it is necessary to know the chemical composition of each to anticipate the results.

Mr. Jennings went on to describe what happens in the heat-affected zones of welds in steel. If the electrode or base metal is unknown, cracks may develop because the weld may be too hard. Machining the weld may be anticipated, but because the critical point has been exceeded and the cooling rate rapid, the heat-affected zone may run as high as 600 Brinell hardness.

The hydrogen gas evolution theory was discussed as a possible cause of some cracks in welds. The hydrogen is evolved from the electrode coatings, is dissolved in the molten metal, and is expelled upon solidification. Low-hydrogen electrodes are available today that are feasible for welding of 0.30 to 0.40% carbon steel without preheating. The problem of welding high-sulphur steels has been solved by the low-hydrogen electrode.

Mr. Jennings touched briefly on the need for a good, simple method to measure weldability, the effect of preheating for welding, and how high carbon and alloy content causes trouble in arc welding.

A long discussion period ensued, mainly on the problem of welding stainless steel with helium and argon gases, and the welding of sulphur-bearing steels which are used to a large extent in the tire industry.

New Chattanooga Sec'y Named

Because of the demands on his time of other duties, A. D. Willis has been compelled to give up his office as secretary of the Chattanooga Chapter A.S.M. At a recent meeting of the executive committee F. E. Hite of the Hite Mfg. Co., was elected to succeed Mr. Willis as secretary. At the same time Robert W. Lusk was elected to replace Mr. Hite on the executive committee.

TTT-Curves Guide Heat Treat

Reported by G. F. Kappelt
Assistant Metallurgist, Bell Aircraft Corp.

Through a thorough understanding of the transformation, temperature, and time (TTT-curves), a knowledge of the heat transfer characteristics of the part being heat treated, and the equipment used, hardening or annealing results can be predetermined. Peter Payson, assistant director of research, Crucible Steel Co. of America, explained the background reasons for these possibilities in his talk, "The TTT-Curve as a Guide to the Heat Treatment of Steel" to the members of the Buffalo Chapter A.S.M. at their February meeting. Details of Mr. Payson's talk have been reported in previous issues of *Metals Review*.

Meehanite Castings Depicted

Reported by Clyde R. St. John
Senior Metallurgist, Permanente Metals Corp.

Two films loaned by the Meehanite Metal Corp. were shown at the February meeting of the Inland Empire Chapter. W. W. Kerlin, service engineer for Cleveland, and H. E. Black, Washington Machinery foundry supervisor, were present to answer questions.

The first film, titled "Meehanite Means Better Castings", gave the engineering characteristics and industrial applications of Meehanite castings. The second showed in color the action of molten metal as it is poured into molds of various sizes, shapes, and complexities.

Michiana Builds New Lab

A new, modernly equipped laboratory building—for studying pilot castings and developing the most suitable foundry techniques for all types of jobs—is now in full operation by Michiana Products Corp., Michigan City, Ind.

This addition to the Michiana metallurgical facilities will provide for general inspection of castings plus radiographic checking to determine specifications, quality, and furnish proof, as is sometimes required for castings used on airplanes.

22d-13. Are You Fabricating Aluminum? *Industry and Welding,* v. 21, March 1948, p. 48-50, 72-76. Reprinted from "Welding and Brazing Aluminum", revised; Aluminum Co. of America.

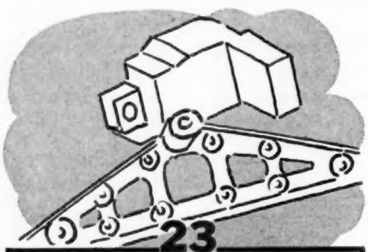
Advantages, equipment, cost of gas, preweld cleaning, and welding technique.

22d-14. Arc Welding Magnesium; Investigation on the Elimination of Cracking. P. F. George. *Metal Industry,* v. 72, Feb. 27, 1948, p. 163-165, 173.

Methods of determining the tendency toward weld cracking, such as metallographic methods of finding the nonequilibrium solidus, and elimination of cracking by control of calcium content.

For additional annotations indexed in other sections, see:

4b-19; 9a-27; 9b-13-14; 12a-36; 12b-18; 12d-2; 15b-9; 15c-3; 19b-36; 24a-58; 24b-23; 27a-34-40.



APPLICATIONS

23a—General

23a-14. Die Casting in the Austin "Devon" Four-Door Saloon. E. N. Field. *Machinery* (London), v. 72, Jan. 29, 1948, p. 153-154.

More than 40 separate items in new British automobile are produced as Zn-alloy die castings.

23a-15. Bearing Selection. Bryce T. Ruley. *Product Engineering,* v. 19, March 1948, p. 149-151.

Calculation of anti-friction bearing life and its relationship to load. Nomograph for speed and life factor.

23a-16. Antifriction Bearings. H. O. Smith. *Factory Management and Maintenance,* v. 106, March 1948, p. 105-115.

Types available and recommended maintenance methods.

23a-17. The Wall of Thin Self-Framed Metal Panels. Robert L. Davison and Howard T. Fisher. *Architectural Record,* v. 103, Feb. 1948, p. 135-139.

The research described was intended to furnish architects and manufacturers with the basic design for a fireproof light-weight wall system which would be applicable to conventional steel or concrete building frames; which would satisfy requirements of fire resistance, weather resistance, insulation, and lack of condensation; which would be mainly shop-fabricated; and which would have a lower first cost and lower maintenance than a conventional wall.

23a-18. Some Notes on the Design, Development and Production of High-Speed Compression-Ignition Engines. (Concluded.) S. Markland and N. Tattersall. *Engineers' Digest,* v. 5, Feb. 1948, p. 81-84. Condensed from an advance copy of a paper for Institution of Mechanical Engineers, Automobile Division, Oct. 1947.

Crankcase and cylinder castings; timing gear and auxiliary drives; pistons; connecting rods; valves; fuel-injection equipment; lubrication systems; detergent oils; cold starting; and testing.

23a-19. Plastic, Rubber Moldings and Metal Parts Combined to Advantage. Herbert Chase. *Materials & Methods,* v. 27, March 1948, p. 67-71.

Combinations of conducting and dielectric properties are provided in electrical parts by judicious use of molded sections containing metallic inserts.

23b—Ferrous

23b-13. Which Wrought Stainless Steel? Part I. Properties and Processability. Stanley P. Watkins and Roland J. Berkol. *Machine Design,* v. 20, March 1948, p. 107-112.

Properties and applicabilities of the various types compared and correlated. (To be continued.)

23b-14. New Developments in Tool Steels—Part I. George A. Roberts. *Tool & Die Journal,* v. 13, March 1948, p. 76-78, 80.

A review. (To be continued.) (Presented to Cleveland Chapter, A.S.M., Oct. 6, 1947.)

23b-15. Selecting Automotive Steels. W. E. Jominy. *Steel,* v. 122, March 8, 1948, p. 82-86, 122, 124.

Some of the more important factors involved in predicting fabricating behavior and mechanical performance of steel in a particular part. Recent experience indicates that much cheaper steels can be used than were formerly thought necessary. Use of proper heat treatment is said to minimize differences between the various alloy steels.

23b-16. Metal Molds for Plastics. Thomas A. Dickinson. *Tool Engineer,* v. 20, March 1948, p. 27-32.

Use of a preliminary test casting to determine whether a given plastics part can be profitably produced. Mold design.

23b-17. Metal Mining and Manganese Steel—Tough Jobs for Manganese Steel. *Edgar Allen News,* v. 26, Feb. 1948, p. 997-1000.

A number of applications.

23b-18. Another Air Marker of Porcelain Enameled Steel. Christian E. Born. *Finish,* v. 5, March 1948, p. 24-27.

Letters 20 ft. high mark Unity Plant of Portland Packing Co.

23b-19. How to Choose the Correct Type of Porcelain Enamel for Specific Applications. Part I. J. E. Hansen. *Finish,* v. 5, March 1948, p. 37-38, 64, 66.

23b-20. Manufacturers Continue to Convert to Stampings. *Steel Processing,* v. 34, March 1948, p. 134-136.

Miscellaneous applications of stamped sheet steel.

23c—Nonferrous

23c-19. Carbide Tool Routs Fiberglas. *American Machinist,* v. 92, Feb. 26, 1948, p. 83.

Satisfactory bits were finally made by cementing a 21/64-in. diameter solid piece of carbide into a 1/2-in. steel shank and grinding the flute into the carbide. Kennametal K4H, a W-Ti carbide with a low percentage of Co binder, proved to have the required wear resistance to stand the abrasiveness of Fiberglas. One bit, for instance, has had a tool life of over 500 linear ft. on four layers of 1/16-in. material, and should be good for at least 300 ft. more before resharpening.

23c-20. A Mark of Distinction. *Die Castings,* v. 6, March 1948, p. 23-24.

Use of Zn and Al die castings for pantograph-type engraving machines.

23c-21. Safety in Numbers. Hiram K. Barton. *Die Castings,* v. 6, March 1948, p. 25, 47-49.

Use of Zn die castings for new type of lock using a code system making possible use of a single type of lock for all purposes with a single key for all the locks, irrespective of their differing purposes.

23c-22. The Use of Decorative Parts in Product Styling. *Die Castings,* v. 6, March 1948, p. 26-28, 45-46.

Use of Zn die castings for miscellaneous products such as refrigerators, stoves, washing machines, and deepfreeze units.

23c-23. Design of an Electric Iron. Maxwell C. Maxwell. *Die Castings,* v. 6, March 1948, p. 31-32, 49-50.

Use of die-cast Al sole plates with tubular Ni-Cr heating elements in new iron with hinged toe section.

23c-24. A New Material for Drill Bits. *Engineering and Mining Journal,* v. 149, March 1948, p. 73.

New patented composition developed in England and said to be hard as tungsten, tough as steel, and unbreakable. It is known as "Carbometal" and a patent claim reads as follows: "An abrasive or cutting tool—comprising a body formed of diamond particles bonded together by a bond which functions as a secondary abrasive and consists of a mixture of boron carbide, silicon carbide, and at least one metallic carbide".

23c-25. The Application of Hard Materials for Rock Cutting Bits. (Concluded.) R. W. Adamson. *Mines Magazine,* v. 38, Feb. 1948, p. 19-20.

23d—Light Metals

23d-34. Note sui Cavi in Alluminio. (Note on Aluminum Cables.) U. Benoffi. *Alluminio,* v. 16, Nov-Dec. 1947, p. 503-507.

The substitution of aluminum for copper in overhead and underground cables and properties of the two metals.

23d-35. Special Alloys Featured at San Francisco Foundry. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 102-103.

Use of Frontier 40-E, an aluminum casting alloy containing Zn, Fe, Mg, Cr, and Ti. The alloy is intended for high-strength aluminum castings which do not require the usual heat treating procedures to attain maximum physical properties. Other properties claimed are exceptional strength, shock resistance, machinability, corrosion resistance, and pressure tightness. Also mentions use of other special alloys at Pacific Brass.

23d-36. Aluminum Alloy Wheels Reduce Trailer Weight. *Automotive Industries,* v. 98, Feb. 15, 1948, p. 45.

23d-37. Neoprene-Washered Nails for Fastening Aluminum Roofing and Siding. *Sheet Metal Worker,* v. 39, Feb. 1948, p. 66-68.

New development. Helpful advice on successful erection of aluminum roofing and siding.

23d-38. Large Aluminum Roofing Installation. *Modern Metals,* v. 4, Feb. 1948, p. 14-15.

Reroofing of Salt Lake City's 84-year-old Mormon Tabernacle with sheet aluminum.

23d-39. Aluminum for Farm Equipment. *Modern Metals,* v. 4, Feb. 1948, p. 19.

23d-40. The Use of Magnesium as a Construction Material in Germany During World War II. Part II. Hubert Altwicker and Ernst Josef deRidder. *Modern Metals,* v. 4, Feb. 1948, p. 20-24.

Some typical die-casting applications and forgings as well as the use of magnesium by the German army. (To be continued.)

(Turn to page 56)

Standard Toolsteels Outlined by Fletcher At Saginaw Valley

Reported by A. Waydak
Engineering Dept., Chevrolet Motor Co.

While many toolsteels are special-purpose materials, made in a great variety of analyses and high in alloy content to obtain hardness, toughness and other properties, only a few compositions actually account for the bulk of the standard applications, Stewart G. Fletcher, chief metallurgist of Latrobe Electric Steel Co., told the Saginaw Valley Chapter A.S.M. at its March meeting.

These steels are made chiefly of scrap and ferro-alloys, with little or no ore added, and particular attention is paid to the selection of scrap to obtain the proper alloy content. The steel is then melted in an electric furnace and cast into ingots. The ingots are reheated and hammered into billets, and then formed into the desired shapes.

Of the high speed steels, those of high vanadium content are abrasion resistant, and those of high cobalt content have good hot hardness for rough cuts and running at red heat, Mr. Fletcher pointed out. He then enumerated other steels and their purposes, such as carbon steels for cold header dies, featuring a tough core and hard case; oil hardening steels, nondeforming, high in manganese, with good wear resistance, for use in dies and punches; and air hardening steels used for blanking dies. The latter are easy to heat treat with little distortion. The high-carbon high-chromium types have good abrasion resistance, requiring full or nearly full hardness, and are desirable in working silicon sheets. Finally, there are the low-carbon tungsten and chromium steels used for hot forming and die-casting dies; they have high fatigue life and withstand tension and compression.

The present-day heat treatment of steels, Mr. Fletcher pointed out, features no generally secret processes. Today we understand pretty well the behavior of steels during treatment and, based on the time-temperature-transformation phenomena of steels, we can predict in advance the characteristics of the steel under treatment. He then touched on surface conditions, such as undesirable carburized or decarburized surface, the extremely hard nitrided case and the flash chromium-plated surface which has a low coefficient of friction and gives longer tool life.

In conclusion, Mr. Fletcher noted that in the usage of tool steels, one prominent factor stands out today and that is the intelligent selection of the steels by the users, who order by metallurgical specifications for each particular application rather than ordering the more "standard" grades.

The question and answer period of the program was ably handled by Ray P. Kells, chief service engineer of the Latrobe Electric Steel Co.

A fine coffee talk was given by Joseph Anderson, works manager of A. C. Spark Plug Division, on "Americanism," urging that we become aware of the privileges which we enjoy in this country, lest, through indifference, we bring about our own downfall from within.

Kinzel Named President Of U. C. & C. Research Labs

A name well known to followers of technical progress is that of Augustus B. Kinzel, whose election as president of Union Carbide and Carbon Research Laboratories, Inc., is his most recent newsworthy accomplishment.

A. B. Kinzel

His list of honors and achievements is formidable. He presented the Campbell Memorial Lecture before the annual meeting of the American Society for Metals last fall, and the following day received the Samuel Wylie Miller Memorial Medal of the American Welding Society. He is currently a director of the American Welding Society, director of the American Institute of Mining and Metallurgical Engineers, and chairman of the Engineering Foundation Board as well as chief consultant in metallurgy to the Los Alamos Laboratories and the Argonne National Laboratories of the Atomic Energy Commission. He is the author of many papers on the testing and welding of metals, on the metallurgy and physical chemistry of steelmaking, and on applied mechanics.

Dr. Kinzel has been associated with various metallurgical units of Union Carbide and Carbon since 1926. He is a graduate of Columbia University, and has studied at M.I.T. and at University of Nancy, France, where he received his Doctor of Science degrees. During the war he did important work for the Manhattan District, the War Production Board, the War Metallurgy Committee, and other government agencies.

Takes Sales Position in L. A.

GEORGE W. STRAHAN, formerly in the sales department of International Nickel Co., and a member of the Executive Committee of the New Chapter A.S.M., has taken a position as sales manager of Westlectric Castings, Inc., Los Angeles.

Magnesium Replaces Diminished Supplies Of Strategic Metals

The metal which met the challenge of war is now meeting with marked success the new challenge of this postwar era when we are faced with depleted metal reserves and find that world resources of many metals are seriously diminished. "This versatile metal, magnesium, for security reasons alone, has an important role to play in replacing these strategic materials," said J. D. Hanawalt of the Dow Chemical Co. as he addressed a large audience of the Ottawa Valley Chapter A.S.M. on March 2. Dr. Hanawalt, previously in charge of metallurgical resarch, is now general manager of Dow's magnesium division at Midland, Mich.

Metal scientists, Dr. Hanawalt said, are thinking in terms of the future and are planning the best distribution for the world's stores of materials. His talk, based on the production of magnesium from sea water, went on to outline the vast possibilities for this metal, and said that as a result of a new electroplating process, magnesium can now also be used in the realm of light decorative metals.

Dr. Hanawalt stressed the importance of this metal to Canadian economy. Power resources and raw materials are abundant in this country and the process does not depend upon scarce or imported materials. The metal is easy to cast and work. Dr. Hanawalt visualizes greatly expanded use in die casting applications.

An interesting exhibit was a copy of a newspaper which was printed directly from photo-engraved magnesium plates. Typing is done on paper strips. These, together with photographs, are made into a page, which is then photographed onto a magnesium plate. When this plate has been etched it is ready to place on the rolls for direct printing.

Dr. Hanawalt was introduced by Molson Hannaford, chairman of the chapter, and was thanked by W. Stewart, Light Alloys, Ltd. An excellent film on the production of magnesium from sea water was shown.

23d-41. Aluminum Trim, Channel and Weather Strip. *Modern Metals,* v. 4, Feb. 1948, p. 26.

New matching series of aluminum metal trims recently introduced.

23d-42. Paris Agricultural Exhibition. *Modern Metals,* v. 4, Feb. 1948, p. 30-32. Translated from *Revue d'Aluminium.*

Varied applications of aluminum in French farm machinery.

23d-43. Light Metals in Automotive Construction. Clay P. Bedford. *Steel,* v. 122, March 15, 1948, p. 102, 104, 106.

Progress made by Kaiser-Frazer in adopting Al and Mg for important auto components.

23d-44. Light Alloys in the Internal Combustion Engine. (Continued.) *Light Metals,* v. 11, Feb. 1948, p. 72-76.

Application of light alloys to crankcases and sumps for all types of engines; light alloy bearings. (To be continued.)

23d-45. Light Alloy Commercial Coachwork. L. Graham Davies. *Light Metals,* v. 11, Feb. 1948, p. 84-88.

British application.

23d-46. Aluminum Piping—Where and Why It's Used. C. B. McLaughlin. *Heating, Piping & Air Conditioning,* v. 20, March 1948, p. 87-89.

Why Al alloys are important piping materials for many industrial applications. Noteworthy properties and design precautions with respect to galvanic action, flexibility, insulation, gaskets, hangers, and supports.

23d-47. Aluminum Plowshares. *Industrial and Engineering Chemistry,* v. 40, March 1948, p. 10A, 12A.

Important new applications.

23d-48. Aluminum—What's It Good For? Roy A. Hunt. *Western Metals,* v. 6, Feb. 1948, p. 19-25.

Miscellaneous uses, especially those which were new in 1947.

23d-49. Eyes Front. *Die Castings,* v. 6, March 1948, p. 34.

Built entirely without rivets, diecast Al eye-glass frames are said to be sturdier than plastic ones.

For additional annotations indexed in other sections, see:
3a-23-25; 3b-37; 3c-13; 3d-11-12; 19a-49; 22b-80.

24a—General

24a-45. Electrical Resistance Wire Strain Gages—Their Development and Use. J. Edwards. *Metal Treatment,* v. 14, Winter 1947-48, p. 213-221.

Development and use including an exposition of fundamental principles. 14 ref. (To be continued.)

24a-46. Optimum Number of Webs Required for a Multicell Box Under Bending. George Gerard. *Journal of the Aeronautical Sciences,* v. 15, Jan. 1948, p. 53-56.

Theoretical results are presented in which the optimum number of webs was found to be a function of the structural thickness ratio only. Nondimensional design charts are included. An investigation was also made to determine the weight penalty involved in using a number of webs other than optimum. It was found that for a slight weight penalty it is possible to reduce the number of webs required and still maintain an efficient design. 13 ref.

24a-47. Stresses in and General Instability of Monocoque Cylinders With Cutouts. Part V—Calculation of the Stresses in Cylinders With Side Cutout. N. J. Hoff and Bertram Klein. *National Advisory Committee for Aeronautics, Technical Note* No. 1435, Jan. 1948, 33 pages.

24a-48. On the Interpretation of Combined Torsion and Tension Tests of Thin-Wall Tubes. W. Prager. *National Advisory Committee for Aeronautics, Technical Note* No. 1501, Jan. 1948, 11 pages.

General ways of testing thin-wall tubes under combined tension and torsion as a means of checking the various theories of plasticity. Suggestions for interpretation of the tests.

24a-49. Summarized Proceedings of Conference on "Stress Analysis"—London, 1947. *Journal of Scientific Instruments and of Physics in Industry,* v. 25, Jan. 1948, p. 19-23.

Meeting of March 25-27, 1947.

24a-50. Undercuts on Threaded Work. R. E. Mills. *Machinery* (London), v. 72, Jan. 29, 1948, p. 140-143.

An undercut is defined as the recess at the shoulder end of the screwed portion of a component which enables the female section to be screwed home. Need for standardization and design factors. Methods for specifying undercut and British standard dimensions.

24a-51. The Future of Steam Locomotives. C. R. H. Simpson. *Engineer,* v. 185, Jan. 30, 1948, p. 113.

Design and metallurgical problems. (Condensed from paper presented at Symposium on Railways, Junior Institution of Engineers, Jan. 16, 1948.)

24a-52. Calculation of Uncoupled Modes and Frequencies in Bending or Torsion of Nonuniform Beams. John C. Houbolt and Roger A. Anderson. *National Advisory Committee for Aeronautics, Technical Note No.* 1522, Feb. 1948, 75 pages.

Presents a simple iteration procedure using numerical integration. All computations can be performed mentally or with the aid of a slide rule. The method applies to nearly all types of beams.

24a-53. Lightness and Strength Combined in Metal-Wood Composites. Kenneth Rose. *Materials & Methods,* v. 27, Feb. 1948, p. 70-73.

How woods of many types are used with a wide variety of metals to provide composite materials required for special combinations of properties.

24a-54. Rubber and Steel. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 107-108.

Advantages and varied applications of rubber expansion joints between metal members.

24a-55. Measurement of Stress by Means of X-Rays. D. E. Thomas. *Journal of Applied Physics,* v. 19, Feb. 1948, p. 190-193.

How the formulas used in stress measurement by X-rays are derived. Points out an error in a recently published book, "X-Rays in Practice", by Wayne T. Sproull.

24a-56. Designing for Economical Manufacture. Benjamin N. Ashton. *Machine Design,* v. 20, Feb. 1948, p. 101-106.

A method which has resulted in substantial cost reduction in manufacture. Improved performance as well as simplified manufacturing are the concrete result of giving production methods adequate consideration during design. The system used is illustrated by its application to several aircraft parts, including landing-gear strut and axle, hydraulic cut-out valve, and hydraulic activating cylinder.

24a-57. Disk Stresses. V. G. Guins and G. H. Heiser. *Machine Design,* v. 20, Feb. 1948, p. 144-148, 188-189.

A practical method for calculating stresses due to rotation and to interference fits.

24a-58. A Clinical Approach to Weldment Design. Gerald Von Stroh. *Welding Engineer,* v. 33, March 1948, p. 36-41.

Previously abstracted from *Steel,* v. 122, Jan. 19, 1948, p. 68-72, 106. See item 24b-7.

24a-59. Dimensional Instability Affects Design of Precision Equipment. Parts I and II. Frederick C. Victory. *American Machinist,* v. 92, Feb. 26, 1948, p. 108-111; March 11, 1948, p. 144-147.

Dimensional instability may be defined as any change, not resulting from wear or abrasion, in dimensions or shape of any unit, part, or assembly. The following causes are most frequently encountered: thermal expansion; unstable constituents; stresses in the material; and applied stresses. The first of these causes is discussed and illustrated by a typical example—a high-speed grinding head driven by a pneumatic turbine—in which expansion and backlash caused a change in preload of bearings. How the condition was remedied by redesign. In Part II—case examples of products supposedly heat treated properly and what was wrong in their handling. (To be continued.)

24a-60. Stress Concentration and Fatigue Failures. Stepan Timoshenko. *Institution of Mechanical Engineers, Proceedings,* v. 157, War Emergency Issue No. 28, 1947, p. 163-169.

Experimental stress analysis required for complex parts and their combination with theoretical calculations. Effects of shot-peening on parts such as axles. Photographs show photoelastic patterns, various stress analysis apparatus, and examples of fatigue cracking.

24a-61. Predesign Research as Applied to Product Development. Roger L. Nowland. *Mechanical Engineering,* v. 70, March 1948, p. 208-210, 225.

Presented at annual meeting, A.S.M.E., Atlantic City, Dec. 1-5, 1947.

24a-62. The Estimation of Stresses in Turbine-Disk Rims. G. F. C. Rogers. *Engineering,* v. 165, Jan. 2, 1948, p. 1-4; Jan. 9, 1948, p. 40-42.

A mathematical analysis.

24a-63. Nonlinear Large-Deflection Boundary-Value Problems of Rectangular Plates. Chi-Teh Wang. *National Advisory Committee for Aeronautics, Technical Note No.* 1425, March 1948, 113 pages.

Relaxation and successive approximation methods used to solve Von Karman's equations as applied to initially flat, rectangular plates with large deflections, under either normal pressure or combined normal pressure and side thrust.

24a-64. The Buckling of a Column on Equally Spaced Deflectional and Rotational Springs. Bernard Budiansky, Paul Seide, and Robert A. Weinberger. *National Advisory Committee for Aeronautics, Technical Note No.* 1519, March 1948, 42 pages.

A solution for the problem. Useful charts relate deflectional spring stiffness, rotational spring stiffness,

(Turn to page 58)

Steelmaking Theory Applied to Meteorites

Reported by Joseph D. Allen, Jr.
Missouri School of Mines

The application of the theories of modern blast furnace and steelmaking processes to the production of iron-nickel alloys in meteorites was discussed in a general talk entitled "Origin and Structure of Meteorites" by Daniel S. Eppelsheimer, associate professor of metallurgical engineering, before the Missouri School of Mines Chapter on Jan. 14.

Dr. Eppelsheimer, who is working on meteorites in conjunction with Harvard University, is particularly interested in studying the relationship existing between the slag and iron-nickel alloy in the Brenham (Kan.) stony-iron meteorite. This is one of a small number of meteorites that have one end completely metallic and the other end completely stony.

The iron-rich portion of the specimen (which is in the Harvard collection) contains 90.48% Fe, 8.59% Ni, 0.16% Co, 0.24% Si, 0.5% S, 0.27% P, and traces of carbon and copper. The stony (slag) portion contains 40.5% SiO_2, trace of Al_2O_3, 0.77% Fe_2O_3, 10.51% FeO, trace of NiO and MnO, 47.18% MgO.

This slag is of the olivine type, the speaker pointed out, and would have a melting point of about 1770° C.; it is unique in containing such a large percentage of MgO. Various theories with regard to the conditions in space that could have formed large quantities of reduced iron, nickel and cobalt and could subsequently have refined these metals were discussed from a critical viewpoint. Dr. Eppelsheimer suggested that other A.S.M. members who may be interested in this question and may have collected specimens showing these transition types get in touch with him.

Samples of iron alloys reduced from meteoritic oxides by aluminothermic reactions were exhibited. This is the first time, to the speaker's knowledge, that such oxides have been reduced from meteoritic materials using aluminum as a reducing agent.

At the conclusion of Dr. Eppelsheimer's speech, the film "Golden Horizons" was shown. This film depicts the development and production of metals from the Stone Age until the present time.

Atomic Energy Is Rome Subject

Reported by M. G. Steele
Kent Electric Corp.

"Atomic Energy and Its Implications" was the subject of the talk delivered by E. E. Thum, editor of *Metal Progress,* before the Rome Chapter A.S.M. on March 1. The many questions in the discussion after the talk were evidence of the unusual interest evoked, and the meeting continued on until well after the usual closing time. Mr. Thum's address has been reported in previous issues of *Metals Review.*

NATIONAL MEETINGS

for May

May 3-4—International Acetylene Association. Annual Convention, Book-Cadillac Hotel, Detroit. (I.A.A., 30 East 42nd St., New York 17.)

May 3-7—American Foundrymen's Association. 1948 Foundry Congress and Show, Convention Hall, Philadelphia. (William W. Maloney, secretary, A.F.A., 222 West Adams St., Chicago 6.)

May 11-16—Engineers' Club of Philadelphia and Franklin Institute of Pennsylvania. Second Engineering Progress Show, Franklin Hall of Franklin Institute, Philadelphia. (Robert L. Braun, Engineering Progress Show Committee, 1317 Spruce St., Philadelphia 7.)

May 26-27—American Iron and Steel Institute. 56th General Meeting, Waldorf-Astoria Hotel, New York. (George S. Rose, secretary, A.I.S.I., 350 Fifth Ave., New York 1.)

May 27-29—Society for Experimental Stress Analysis. Annual Meeting, Roosevelt Hotel, Pittsburgh. (W. M. Murray, secretary, S.E.S.A., Central Square Station, Cambridge 39, Mass.)

and buckling load, for columns having 2, 3, 4, and an infinite number of spans.

24a-65. The Place Bolt. C. L. Brackett. *Fasteners,* v. 4, no. 4, 1948, p. 16-19.

A special type of bolt which provides for elastic yield without reduction in shank diameter. The head is formed with a centrally disposed recess in its upper face, and a circular recess adjacent to the shank in its underface. Between the radii of these recesses a diaphragm of metal is arranged in the form of the conical surface of a frustum. Weight savings in comparison with standard bolts. Construction is applicable to both bolts and cap screws.

24a-66. New Method of Producing Three-Dimensional Plaster Models. John S. Haldeman. *Machinery,* v. 54, March 1948, p. 144-149.

A time-saving method applicable in automobile, aircraft, and shipbuilding industries which involves the use of a "contour developer".

24a-67. Progressive Die Design, Part II. C. W. Hinman. *Modern Machine Shop,* v. 20, March 1948, p. 124-128.

A method for designing a double die which utilizes the scrap metal to feed two rows of workpieces through the several stages preceding the final operation. (To be continued.)

24a-68. Three Methods for Spring Stress Calculation. *Mainspring,* v. 12, Feb. 1948, p. 1-4.

Outlines the ordinary-stress method; the average-stress method; and the corrected-stress method; and compares their accuracy and usefulness.

24a-69. The Development of Complex Patterns. A. Dickason. *Sheet Metal Industries,* v. 25, Feb. 1948, p. 345-348.

First of a series dealing with layout of sheet-metal ducts of complex design. (To be continued.)

24a-70. Designing Tapered Gears. B. Bloomfield. *Machine Design,* v. 20, March 1948, p. 125-130.

Graphical construction and mathematical analysis are explained for both on-center and offset types.

24a-71. Ring Deflection. H. D. Tabakman. *Machine Design,* v. 20, March 1948, p. 131-134, 196.

Mathematical derivations and curves for calculation of the above for circular rings loaded normal to the plane of curvature.

24a-72. Leaf-Spring Deflection. F. Heller. *Machinery* (London), v. 72, Feb. 26, 1948, p. 274-276.

Design calculations.

24a-73. Forging Die Design; Helve-Hammer Dies. John Mueller. *Steel Processing,* v. 34, March 1948, p. 137-140.

24a-74. Stresses in Turbine Disks at High Temperatures. E. P. Popov. *Journal of the Franklin Institute,* v. 243, May 1947, p. 365-389.

Results of a study of stress distribution and creep deformation in rotating disks. It is primarily confined to stress distribution and deformations that occur during the steady state for service periods beyond the interval in which rather rapid transient creep takes place. A modified solution of a current method which depends only on the data derivable from tension-creep tests. This results in simplification of the solution and greatly expands the use of normally available test data. The analyses apply only to materials found stable for high-temperature service.

24a-75. The Compound Cylinder and the Strength Problem. C. W. MacGregor and L. F. Coffin, Jr. *Journal of the Franklin Institute,* v. 243, May 1947, p. 391-421.

Effects of various strength theories on design of compound cylinders composed of as many as four concentric tubes. The problem considered is limited to simultaneous yielding in all the tubes under the action of bore pressure. New short design procedures using graphical means. The methods used are flexible since component tubes of different materials following different strength theories can be treated as easily as cylinders composed of tubes of one material.

24a-76. Numerical Transformation Procedures in Continuous Beam Analysis. Stanley U. Benscoter. *Journal of the Franklin Institute,* v. 244, July 1947, p. 15-26.

Several new procedures for calculation of bending moments in continuous beams. A mathematical demonstration of the validity of the procedures.

24a-77. A Principal Stress Method of Stress Analysis. H. B. Maris. *Journal of the Franklin Institute,* v. 244, July 1947, p. 27-62.

A new method for analysis of photo-elastic strain figures.

24a-78. An Integral-Equation Approach to Problems of Vibrating Beams. Part II. Walter T. White. *Journal of the Franklin Institute,* v. 245, Feb. 1948, p. 117-133.

Mathematical calculations and their use by application to twisted turbine blades. 42 ref.

24a-79. Partially Plastic Thick-Walled Tubes. C. W. MacGregor, L. F. Coffin, Jr., and J. C. Fisher. *Journal of the Franklin Institute,* v. 245, Feb. 1948, p. 135-158.

A theory is presented for the partial plastic yielding of thick-walled cylindrical tubes acted upon by any combination of internal pressure, external pressure, and end load when the material follows an arbitrary stress-strain law. The solution combines the distortion-energy theory of plastic flow and the effects of elastic compressibility of the plastic material. Numerical values for stresses and strains are given for certain special cases and results are compared with earlier approximate theories.

24b—Ferrous

24b-22. Methode de Calcul Simplifiée Permettant d'Etablir le Projet de Construction d'un Aimant Permanent a Grand Engrefer. (Simplified Method of Calculation Permitting Establishment of Design Factors for Permanent Magnets Having Large Air Gaps.) H. Gondet and J. Surugue. *Journal des Recherches du Centre National de la Recherche Scientifique,* No. 1, 1947, p. 23-36.

24b-23. Welded Steel Construction for Hydro-Electric Power Plants. Owen J. Aftreth and Anthony J. Perry. *Power Generation,* v. 52, Feb. 1948, p. 98, 100, 102.

Proposed new design breaks away from traditional use of concrete. Comparative details and costs for a 50,000-kw. plant. Various advantages and savings.

24b-24. Tool Design and Construction for the Apex Fold-A-Matic Ironer. Part I. Carl F. Benner. *Tool & Die Journal,* v. 13, Feb. 1948, p. 48-51.

Tooling and production will be detailed, step by step. (To be continued.)

24b-25. Spring Design and Manufacture. Part II. John A. Roberts. *Wire Industry,* v. 15, Feb. 1948, p. 109-112.

Design calculations for internal-combustion-engine valve springs, including volute springs, a feature of which is that the coils nest inside each other when the spring is compressed. Methods used in manufacture of coiled springs.

24b-26. Bolted Assemblies. W. C. Stewart. *Machine Design,* v. 20, March 1948, p. 153-158.

Factors to be considered in specifying and applying threaded fastenings. Material selection and proper amount of torquing. 10 ref. (Based on paper presented at the recent annual meeting of S.A.E., Detroit.)

24b-27. Ferromagnetic Metals; Identification and Measurement of Internal Stresses. Part I—Magnetic Tests. (Continued.) Albert Borowik. *Iron and Steel,* v. 21, Feb. 1948, p. 39-43.

Apparatus and necessary data. (To be continued.)

24b-28. Perforated Cover Plates for Steel Columns; Compressive Properties of Plates Having Ovaloid, Elliptical, and "Square" Perforations. Ambrose H. Stang and Bernard S. Jaffe. *Journal of Research of the National Bureau of Standards,* v. 40, Feb. 1948, p. 121-128.

Tests were made to determine the mechanical properties of perforated cover plates intended to be used as a substitute for lattice bars or batten plates in built-up box-type columns. Results for various plate designs and plate-column combinations.

24b-29. Tipo de Calculo Facilitado Para as Dimensoes de Billets ou Plantinas Geradores de Laminados Chatos. (Simplified Method for Calculation of the Dimensions of Spheres and Plates made of Rolled Sheet.) E. Orosco. *Boletim da Associacao Brasileira de Metais,* v. 3, Oct. 1947, p. 609-619; discussion, p. 619-623.

A simplified method of calculation along with formulas, tables, and graphs to facilitate the manufacture of cylinders and spheres from rolled sheets.

24b-30. Influence of the Location of Longitudinal Cracks on the Impact Strength of Tempered Spring Steel. (In Russian.) G. I. Pogodin-Alekseev. *Zavodskaya Laboratoriya,* (Factory Laboratory), v. 13, Dec. 1947, p. 1500.

A crack parallel to the direction of impact has no influence on impact strength. However, it is claimed that the strength may double when cracks perpendicular to the direction of impact are present. This indicates the possibility of increasing strength of structural parts by making them in laminated form.

24b-31. Numerical-Graphical Method of Stressing Hollow Girders. J. Lockwood Taylor. *Aircraft Engineering,* v. 20, Feb. 1948, p. 34.

Mathematics of simplified method of stressing developed from the ship-beam system and extended to axial stresses due to torsion.

24b-32. Report of Committee 5—Track. E. W. Caruthers and Others. *American Railway Engineering Association, Bulletin,* v. 49, Feb. 1948, p. 323-371.

Committee report includes separate reports on Fastenings for Continuous Welded Rail, Progress Report on Performance of Solid Manganese Crossing Frogs and Special Frog Support; Progress Report on Fatigue Tests of Manganese Steel; Design of and Stresses in Tie Plates; Hold-Down Fastenings for Tie Plates; Design, Use and Economy With Respect to Minimizing Tie Wear; and other miscellaneous reports.

24b-33. Service Tests of Various Types of Joint Bars. Ray McBrian and Others. *American Railway Engineering Association, Bulletin,* v. 49, Feb. 1948, p. 405-415.

The final report of the tests of

(Turn to page 60)

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	May 12	Elks Club	S. P. Watkins	Practical Metallurgy of Stainless and Heat Resistant Steels
Baltimore	May 17	Engineers Club	F. B. Foley	Behavior of Metals Under Stress at Elevated Temperatures
Boston	May 7	United Shoe Machinery Corp., Beverly, Mass.	R. S. Archer	Molybdenum in Metallurgy
Buffalo	May 13	Bethlehem Steel Supervisors Club		Annual Meeting
Calumet	May 11	Phil Smidt & Sons, Hammond, Ind.	Hugh J. McDonald	Corrosion of Metals
Cedar Rapids	May 11	Hotel Roosevelt	R. G. McElwee	New Developments in Cast Iron
Chicago	May 10	Furniture Mart Club Rooms		Science and World Peace
Cincinnati	May 14	Terrace Park Country Club		Annual Election Meeting
Cleveland	May 3	Cleveland Club	O. W. McMullan	Metallurgical Factors Affecting Machinability
Columbus	May 11	Fort Hayes Hotel	E. A. Hoffman	Stress-Proofed Steels
Dayton	May 12	Miami Hotel		Home Talent Nite
Des Moines	May 11	Younkers Tearoom	V. J. Peterson	Better Things for Better Living Through Chemistry
Detroit	May 10	Engineering Society	A. H. Underwood	Recent Developments in Nonferrous Bearings
Eastern New York	May 11	Circle Inn, Latham, N. Y.		Annual Meeting
Fort Wayne	May 10	Chamber of Commerce		Annual Meeting
Hartford	May 11	Hartford Trade School	F. B. Foley	High-Temperature Alloys
Indianapolis	May 17	McClarney's Restaurant	W. J. Taylor	New Developments in Steel Mill Practice
Los Angeles	May 27	Rodger Young Auditorium	Niels E. Hendrickson and Edgar Brooker	Heat Treatment and Fatigue of Spring Steel
Mahoning Valley	May 18	Cooper-Bessemer Corp., Grove City, Pa.	Thomas E. Eagan	Plant Visit
Milwaukee	May 18	The City Club of Milwaukee		Annual Meeting
Montreal	May 3	Queen's Hotel	W. A. Mudge	Age Hardenable Nickel Alloys
Muncie	May 18	Muncie Central High School	E. E. Thum	Atomic Energy and Its Implications to Economics, Morality and Politics
New Haven	May 20	Hotel Taft	R. E. Zimmerman	Economica of the Steel Industry
New Jersey	May 17	Essex House, Newark	J. B. Austin	Vocational School Night Nondestructive Testing
New York	May 10	Building Trades Club	Frank G. Foote	Some Materials Problems Encountered in Atomic Research
North West	May 18	Radisson Hotel, Minneapolis		Annual Meeting
Northwestern Pa.	May 27	Erie, Pa.	J. R. Vilella	Metallographic Technique
Notre Dame	May 12	Engineering Auditorium, University of Notre Dame	Morris Cohen	Inside High Speed Steel
Oak Ridge	May 18	Andrew Johnson Hotel Knoxville, Tenn.	Reid Kenyon	Developments in Finishing Steel for Protective Purposes
Ontario	May 7	Leonard Hotel, St. Catharines	E. S. Rowland	Practical Applications of Physical Metallurgy
Ottawa Valley	May 4	Bureau of Mines	C. K. Lockwood	Stainless Steel Today and Tomorrow
Penn State	May 11	Mineral Industries Building	John Chipman	Metallurgy of Liquid Steel
Philadelphia	May 21			Annual Meeting
Pittsburgh	May 13	Mellon Institute	A. R. Troiano	Transformations in Steels and The Jominy Curve
Pueblo Group	May 20	Minnequa Club	J. T. MacKenzie	Cast Irons
Purdue	May 17	Lincoln Lodge	E. E. Thum	Atomic Energy and Its Implications to Economics, Morality and Politics
Rochester	May 10			Annual Meeting
Rocky Mountain	May 21	Oxford Hotel, Denver	J. T. MacKenzie	Cast Irons
Saginaw Valley	May 18	Fischer's Hotel, Frankenmuth	Dr. Lee	Humanics Ladies Night
St. Louis	May 21	Hotel York		Annual Meeting
Southern Tier	May 17	State Tech., Binghamton		Annual Meeting
Springfield	May 17	Hotel Sheraton	W. F. Ross	Controlled Heating for Forging
Texas	May 4	Ben Milam Hotel	A. G. Sturrock	Relationship Between Microstructure and Machinability
Terre Haute	May 10	Indiana State Teachers College Student Union		Ladies Night
Toledo	May 27	Maumee River Yacht Club	Henry M. Heyn	Prepared Atmospheres
Tri-City	May 4	Cafeteria, Rock Island Arsenal	O. E. Cullen	Gas Carburizing, Carlon Restoration and Carbon Control
Tulsa	May 11	Spartan Cafeteria	J. A. Rosa	Heat Treatment
Virginia Polytechnic Institute	May 11	Mineral Industries Building		Business Meeting and Movie "Streamlined Steel"
Washington	May 10	Brook Farms Restaurant	F. B. Foley	Behavior of Metals Under Stress at Elevated Temperatures
Western Ontario	May 14		J. S. Fullerton	Production Brazing
Wichita	May 20	Broadview Hotel	A. S. Jameson	Metallurgy of Ball and Roller Bearing Manufacture
Worcester	May 12	Worcester Polytechnic Institute	L. S. Gleason	Plastics
York	May 12	Gettysburg	Arnold S. Rose	The Metallurgist and Industry

various designs for 112 and 131-lb. R.E. rail which were installed on tangent track on the Atchison, Topeka & Santa Fe Railway and Pennsylvania Railroad in 1937. Beneficial effect of end hardening is also shown.

24b-34. Sixth Progress Report of the Rolling-Load Tests of Joint Bars. R. S. Jensen. *American Railway Engineering Association, Bulletin,* v. 49, Feb. 1948, p. 416-425.

Details of results obtained during the past year at the University of Illinois.

24b-35. Corrugated Rail—Causes and Remedy; Effect Upon Riding Qualities of Tracks and Upon the Costs of Track and Equipment Maintenance. Maro Johnson and Others. *American Railway Engineering Association, Bulletin,* v. 49, Feb. 1948, p. 426-427.

Extracts from a letter from E. Bennett, civil engineer, New South Wales Railways, Sydney, Australia; and a description by Barton Wheelwright, chief engineer, of the formation and later disappearance of corrugation on a branch line of the Canadian National Railways.

24b-36. Third Progress Report on Corrugated Rails. R. E. Cramer. *American Railway Engineering Association, Bulletin,* v. 49, Feb. 1948, p. 428-429.

An attempt to produce corrugation by spinning locomotive wheels. Microscopic examination of the hard bright spots of corrugations has convinced the writer that they were formed by the steel being heated to a temperature above the recrystallizing temperature, followed by fast cooling from the large mass of metal in the rail head. Short slips of a locomotive driver could develop the heat necessary to recrystallize the metal and form the corrugations.

24b-37. Development and Characteristics of Fractures Under Engine Burns in Rail Together With Investigation as to the Effectiveness of Welding up Engine Burns by Oxy-Acetylene or Electric Methods. J. B. Akers and Others. *American Railway Engineering Association, Bulletin,* v. 49, Feb. 1948, p. 429-434.

Data are tabulated, charted and discussed.

24b-38. Causes of Shelly Spots and Head Checks in Rail Surfaces; Develop Measures for Their Prevention. F. S. Hewes and Others. *American Railway Engineering Association, Bulletin,* v. 49, Feb. 1948, p. 434-437.

Summarizes several more detailed reports which are being abstracted separately. The most promising developments so far appear to be use of 3% Cr steel, modified head contours, and heat treated rails.

24b-39. Sixth Progress Report of the Shelly Rail Studies at the University of Illinois. R. E. Cramer. *American Railway Engineering Association, Bulletin,* v. 49, Feb. 1948, p. 437-446.

Summary of previous work and results of rolling-load tests in a special test machine. Results of observations of rails in service on the C. & O. on curved sections. Fractures of the shelly type are illustrated.

24b-40. Progress Report on Shelly Rail Studies. H. A. Blank and G. K. Manning. *American Railway Engineering Association, Bulletin,* v. 49, Feb. 1948, p. 446-463.

Results of experimental work at Battelle Memorial Institute on 69 specimens. Shelled and unshelled carbon and chromium-steel rails which had been subjected to the same service conditions were examined with respect to structure, composition of residual elements, and mechanical properties. Effects of cold work on mechanical properties. Since it appears that both hardness and microstructure affect shelling resistance, and since improvement of both can be obtained by proper heat treating, heating and cooling curves were obtained for various internal locations in 113-lb. rail. This information will be useful in designing commercial equipment for heat treatment of rail.

24b-41. Effect of Bolt Spacing on Rail Web Stresses Within the Rail Joint. *American Railway Engineering Association, Bulletin,* v. 49, Feb. 1948, p. 464-490.

A report of work done at University of Illinois. Also includes Fatigue Tests of Rail Webs, by R. S. Jensen, giving results of corrosion-fatigue tests using 36% H_2SO_4 on uncoated specimens and on three groups of painted specimens to test the practicability of different types of paint for corrosion-fatigue prevention.

24b-42. Fourteenth Progress Report of the Cooperative Investigation of Failures in Railroad Rails in Service and Their Prevention. R. E. Cramer. *American Railway Engineering Association, Bulletin,* v. 49, Feb. 1948, p. 490-495.

Results of examination of control cooled rails which failed in service. Also includes a summary of work reported elsewhere in this issue and in v. 47, 1946, p. 473.

24c—Nonferrous

24c-6. Design Stresses for Beryllium-Copper Parts. Robert W. Carson. *Electrical Manufacturing,* v. 41, March 1948. p. 76-80, 176.

Maximum allowable working stresses for three age hardening alloys of beryllium copper suitable as spring materials depend to a large extent upon the amount of cold work done upon the material between the solution anneal at the mill and the final heat treatment at the fabricator. 18 ref.

24d—Light Metals

24d-4. Preliminary Data on Buckling Strength of Curved Sheet Panels in Compression. Eugene E. Lundquist. *National Advisory Committee for Aeronautics, Wartime Report No.* L-690, Nov. 1941, 12 pages.

Results of tests obtained in the use of 24 S-T as the specimen material.

24d-5. Comparison of the Compressive Strength of Panels with Alclad 24 S-T 81 Sheet or With Alclad 24 S-T 86 Sheet Riveted to Alclad 24 S-T 84 Hat-Section Stiffeners. Robert A Weinberger, Carl A Rossman, and Gordon P. Fisher. *National Advisory Committee for Aeronautics, Wartime Report No.* L-587, April, 1944, 13 pages.

Tables and charts of data.

24d-6. Prediction and Reduction to Minimum Properties of Plate Compressive Curves. E. H. Schuette and J. C. McDonald. *Journal of the Aeronautical Sciences,* v. 15, Jan. 1948, p. 23-27, 48.

A method for predicting plate compressive curves or reducing them to minimum properties, based on similarities that exist between such curves and the stress-strain curve for the material. Comparison with experimental results for Mg and Al indicates that the method is satisfactory for extruded material.

24d-7. Buckling of Curved Sheet in Compression and Its Relation to the Secant Modulus. E. H. Schuette. *Journal of the Aeronautical Sciences,* v. 15, Jan. 1948, p. 18-22.

Compression tests were made on 87 curved magnesium alloy panels with aspect ratios near unity to determine the buckling stress. Panel radius-thickness ratios ranged from 86 to 515. A formula for the buckling stress for such panels was developed from the data.

24d-8. Engineering for Aluminum Alloy Castings. T. R. Gauthier and H. J. Rowe. *American Foundryman,* v. 13, Feb. 1948, p. 27-36.

The properties of the various aluminum alloys. Diagrams show suggested design details for simple structural elements. Recommended heat treating procedures, use of inserts of other metals to form wear-resisting surfaces, and the different casting processes, as well the effects of different mold materials. (Presented at A.S.M.E. Annual Meeting, Atlantic City, Dec. 3, 1947.)

24d-9. Stresses in and General Instability of Monocoque Cylinders With Cutouts. Part IV—Pure Bending Tests of Cylinders With Side Cutout. N. J. Hoff, Bruno A. Boley, and Louis R. Viggiano. *National Advisory Committee for Aeronautics, Technical Note* No. 1264, Feb. 1948, 91 pages.

Stress-distribution results are presented for pure bending tests of nine 24 S-T Alclad cylinders of 20-in. diameter, 30 to 90-in. length, and 0.012-in. wall thickness, reinforced with 24 S-T aluminum-alloy stringers and rings, and with cutouts on one side of the cylinders, situated symetrically with respect to its horizontal plane of symmetry.

24d-10. Structural Evaluation of an Extruded Magnesium Alloy T-Stiffened Panel. Norris F. Dow and William A. Hickman. *National Advisory Committee for Aeronautics, Technical Note* No. 1518, Feb. 1948, 19 pages.

Compressive tests were made of different lengths of a ZK 60 A magnesium-alloy flat panel having skin and longitudinal T-section stiffeners extruded as one integral unit. Results indicated that the extruded panel had structural characteristics which were somewhere between those for 24 S-T and those for 75 S-T Y-stiffened panels, but, because of the integral nature of the extruded construction, required far fewer rivets to assemble.

24d-11. The Strength of Thin-Web Beams With Transverse Load Applied at an Intermediate Upright. L. Ross Levin. *National Advisory Committee for Aeronautics, Technical Note No.* 1544, Feb. 1948, 20 pages.

Results of tests of several 24 S-T aluminum-alloy thin-web beams with transverse load applied at the end of an intermediate upright. A method of computing stresses and predicting failures in these directly loaded uprights. Comparison between experimental and calculated results.

For additional annotations indexed in other sections, see:
3a-27; 6a-24; 14c-21; 19a-40-46-48; 20a-91-117-130; 22a-61; 22b-82-91; 27a-36.

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, Ohio, unless otherwise stated.

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NOW AVAILABLE: Chemical, metallurgical engineer with 25 years' industrial experience. Excellent for management, metal sales service, purchasing. Northern Ohio preferred. Box 4-85.

INDUSTRIAL ENGINEER: Seeks change because of limited advancement in present organization. Eight years' experience with precision electrical instruments in methods, cost estimates, mechanical investigation, war packaging project, foreman, layout, time study, standard data, quality control, office forms. Four years' refrigeration and air conditioning mechanic. Age 31, married. Well recommended by present employer. Box 4-90.

METALLURGIST: Age 25, B.S. in metallurgical engineering. Three years' experience in metallurgical laboratory of large eastern steel plant. Knowledge of heat treatment, physical testing, and development of new alloys. Desires research and development position. Will consider fellowship. Prefers Chicago area or West Coast. Box 4-95.

METALLURGICAL ENGINEER: B.S. in metallurgical engineering. Age 29, married, veteran. Four years' experience in metallurgical and metallographic laboratories. Desires position in metallographic research and development with firm in vicinity of New York City in order to do graduate work in night school. Available now. Box 4-100.

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METALLURGICAL ENGINEER: Age 25. B.S. and M.S. in metallurgical engineering from Michigan Tech. Two years' experience in gray and malleable iron foundry. Supervised small jobbing foundry for Navy overseas during war. Well informed on latest developments of malleable iron annealing cycles and atmosphere requirements. Desires position as contact engineer or shop metallurgist. Box 4-115.

METALLURGICAL ENGINEER: Age 24, married. Graduating with B.S. in metallurgical engineering, University of Illinois, June 1948. One year's experience in metallurgical research as laboratory assistant. Three years as A.A.F. pilot. Desires position with future in development or production. Available June 30. Box. 4-120.

METALLURGIST: 11 years' experience in all phases of ferrous metallurgy—melting, rolling, forging, heat treatment, welding, supervision of metallurgical laboratory and sales experience. Desires sales and service work in the metallurgical field. Box 4-125.

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METALLURGICAL ENGINEER: B.S. from University of Illinois in June 1948. Age 24, single, veteran. Desires position with future in development or production work. Midwest preferred. Available June 20, 1948. Box 4-160.

CONSULTANT: On new products and markets in metallurgical and chemical industries available on part-time basis. Extensive experience in research, developing, production and marketing. No job too small, and in position to handle large jobs requiring complete survey and program for developing new products and markets. Primary interest is in companies located in Pennsylvania, New Jersey, New York, Maryland and Delaware. Will consider financial interest in the right companies. Box 4-165.

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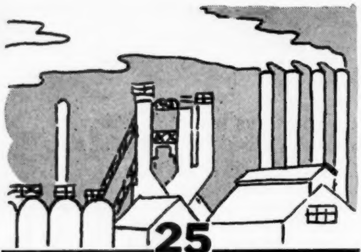


25 STATISTICS

25a—General

25a-30. Pattern Purchase Considerations. W. G Schuller. *American Foundrymen's Assoc. Preprint* No. 47-38, 1947, 2 pages.

25a-31. Economics of Castings Use. Everett Leitala. *American Foundryman,* v. 13, March 1948, p. 48-51.

Factors which indicate when castings are most economical to use. The pattern evolved for evaluating the economics of castings can be adapted to evaluating other production processes.

25a-32. Price-Volume Ratios of Metals. *Materials & Methods,* v. 27, March 1948, p. 105.

Graph shows comparative quantities purchasable for one dollar (Jan. 1948).

25b—Ferrous

25b-30. Steel "Extras"—Why They Exist and How to Save on Them. Harold A. Knight. *Materials & Methods,* v. 27, Feb. 1948, p. 61-65.

Theory and practice of the extra system, particularly for the less experienced steel buyer, so that he can more intelligently make his purchases and avoid payment of unnecessary extras.

25b-31. Polish Iron and Steel Industry Progress. *Metal Bulletin,* Feb. 3, 1948, p. 7.

25b-32. Spectre of Iron Ore Shortage Dims Dreams of More Pig Iron. Bill Lloyd. *Iron Age,* v. 161, Feb. 19, 1948, p. 113-114.

The rush to expand blast furnace production and get early spring shipments.

25b-33. The Sheet and Strip Shortage. *Steel,* v. 122, Feb. 23, 1948, p. 55-62.

Results of a survey. Many tables and graphic charts, and a list of U. S. producers of sheet and strip, including capacity tonnages for each of six types of product.

25b-34. Material Shortages Strangle Efforts of Italian Steel Industry. *Iron Age,* v. 161, Feb. 26, 1948, p. 132-133.

Statistical and economical information.

25b-35. The Gray Iron Castings Industry. Raymond L. Collier. *Foundry,* v. 76, March 1948, p. 94-95, 206, 208, 210, 212, 214.

Part of a survey-report recently completed by the Gray Iron Founders' Society. Extensive statistical data. (To be continued.)

25b-36. Sheet Steel Supply Can Be Extended By Better Materials Engineering. T. G. DuMond. *Materials & Methods,* v. 27, March 1948, p. 61-66.

At least half of the industries plagued by a shortage of sheet and strip steel can help ease their own problems by taking advantage of better grades of steels, in which wastage is less and quality of product higher.

25b-37. The Iron and Steel Industry in Russia. *Engineering,* v. 165, Feb. 6, 1948, p. 141-143. Translated and condensed from article by J. Alexandrovsky, *Hutnické Listy* (Metallurgical Topics), No. 1-3, 1946.

Charts, tables, and maps.

25b-38. Iron Ore. M. D. Harbaugh. *Mining Congress Journal,* v. 34, Feb. 1948, p. 74-78.

1947 statistics and future prospects.

25b-39. Ferro-Alloys in 1947. Edwin K. Jenckes. *Mining Congress Journal,* v. 34, Feb. 1948, p. 115-118.

Economic trends and 1947 statistics.

25b-40. Polish Iron and Steel. F. Wirth. *Iron and Steel,* v. 21, Feb. 1948, p. 44.

Developments in the territory formerly a part of Germany.

25b-41. European Economy; Outlook for Iron and Steel Production. *Iron and Steel,* v. 21, Feb. 1948, p. 52-54, 64.

Based on reports of technical committees on iron and steel and on hard coke, representing sections D and E of Volume II of the Report of the Committee of European Economic Co-operation and issued by the British Iron and Steel Federation as a supplement to the Statistical Bulletin.

25b-42. The Reconstruction Program; Some Technical Aspects. T. P. Colcough. *Iron and Steel,* v. 21, Feb. 1948, p. 57-62. Second Triennial Harold Wright Lecture.

An extensive discussion of the British program for modernization of their iron and steel industry. (Presented to Cleveland Scientific Institute, Great Britain, Nov. 12, 1947.)

25b-43. Ship 79,685,143 Gross Tons Lake Superior Ore in 1947. *Skillings Mining Review,* v. 36, March 13, 1948, p. 1-2, 15.

Statistical data.

25c—Nonferrous

25c-18. Gold. Donald H. McLaughlin. *Mining Congress Journal,* v. 34, Feb. 1948, p. 67-71.

Present economic trends and future prospects.

25c-19. Copper. James Douglas. *Mining Congress Journal,* v. 34, Feb. 1948, p. 79-82.

Economic trends of 1947, and future prospects.

25c-20. Lead. Simon D. Strauss. *Mining Congress Journal,* v. 34, Feb. 1948, p. 86-88.

Economic trends of 1947 and future prospects.

25c-21. Silver. Pat McCarran. *Mining Congress Journal,* v. 34, Feb. 1948, p. 92-93.

Economic trends and government actions.

25c-22. The Outlook for Quicksilver. Gordon I. Gould. *Mining Congress Journal,* v. 34, Feb. 1948, p. 94-95.

Economic trends.

25c-23. Antimony. James P. Bradley. *Mining Congress Journal,* v. 34, Feb. 1948, p. 98-99.

Economic trends and 1947 statistics.

25c-24. Tin. Erwin Vogelsang. *Mining Congress Journal,* v. 34, Feb. 1948, p. 113-114.

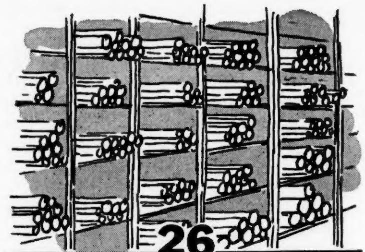
Trends and 1947 statistics.

25c-25. Mine Production of Lead in 1947. *Skillings Mining Review,* v. 36, March 6, 1948, p. 1, 7, 15.

Regional and statewise statistics for the U. S.

25c-26. Mine Production of Copper. Helena M. Meyer and Charles White Merrill. *Western Metals,* v. 6, Feb. 1948, p. 52, 54-56.

Data for 1947 by states.



26 MISCELLANEOUS

26a—General

26a-24. Trends in Metallurgical Research. Cyril Stanley Smith. *Yearbook of the American Iron and Steel Institute,* 1947, p. 529-537.

Discusses need for greater emphasis on fundamental research in metallurgy. (Presented at A.I.S.I. Meeting, New York, May 21-22, 1947.)

26a-25. Research for Ceramic Industries. Battelle Memorial Institute, Columbus, Ohio. 15 pages.

A profusely illustrated brochure which describes the organization and administration of research at Battelle and the facilities for research in ceramic products, including abrasives, cements, vitreous enamels, glass, pottery, heavy clay products, refractories, terra cotta, and whitewares.

26a-26. The Interrelation of Engineering and Metallurgy. Arthur P. M. Fleming. *Engineering,* v. 165, Jan. 30, 1948, p. 116.

Part which metallurgy played in development of steam and gas turbines, jet engines, and production of atomic energy, pointing out interrelationships of the various branches of science and technology. (Condensed from lecture presented to Institute of British Foundrymen, London, Jan. 16, 1948.)

26a-27. Problems Encountered by the R.E.M.E. in the Field. E. Bertram Rowcroft. *Engineering,* v. 165, Jan. 30, 1948, p. 117-120. Condensed from the fourth James Clayton Lecture.

An extended description of some of the problems in connection with ordnance equipment encountered by the Corps of Royal Electrical and Mechanical Engineers during World War II. Metallurgical and other problems in connection with gun barrels, recoil springs, and carriages, tanks; landing craft, amphibious vehicles; artillery director systems; and other military equipment. (Presented to Institution of Mechanical Engineers, London, Dec. 19, 1947.)

26a-28. War Department's Research and Development Program. E. A. Routheau. *Metal Progress,* v. 53, Feb. 1948, p. 249-250.

A number of important unsolved metallurgical problems of both practical and fundamental types in which the U. S. Army is interested.

26a-29. Oxygen in Steelmaking, Minerals Share Convention Spotlight. *Iron Age,* v. 161, Feb. 26, 1948, p. 127-130.

Reviews proceedings of 1948 annual A.I.M.E. meeting, New York.

26a-30. Time: Advancement Through the Years. George G. Ensign. *Scientific Monthly,* v. 46, March 1948, p. 206-212.

Development of present-day watches, including development of an improved lubricant at Mellon Institute and an improved mainspring alloy at Battelle Memorial Institute, both for Elgin.

(Turn to page 64)

MANUFACTURERS' LITERATURE

Use the Handy Coupon to Obtain This Helpful, Free Literature

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8-page, 2-color bulletin 120-23-B11 covers foundry cupola blowers of both the rotary positive and centrifugal types; includes table giving melting rate, with air volume and pressure required, for standard size cupolas. Roots-Connersville Blower Corp.

23. Buffing, Polishing

20-page illustrated booklet describes line of buffing and polishing compositions and wheels, with interesting charts and applications. Buckeye Products Co.

24. Fabrication, Light Metals

Engineering, tool and production facilities offered by sheet metal fabricator specializing in the light metals are described and illustrated in 20-page brochure. Colgate Mfg. Co.

25. Forgings, Nonferrous

Advantages to be obtained by using nonferrous forgings for many parts are given in February issue of Nonferrous Forgings Digest. Many parts are illustrated. Brass Forging Assn.

26. Furnaces, Melting

4-page illustrated leaflet describes an improved reverberatory melting furnace. Combustion is improved, lining life increased, fuel consumption decreased. Melts all types and kinds of metals. Sklenar Furnace & Mfg. Co.

27. Metal Sawing

16-page booklet unique engineering experience embodied in line of four basic circular sawing machines for cutting stock from ¼" to 16½", all utilizing the advantages of the triple-chip saw blade in diameters from 8" to 45", with correct automatic sharpeners to grind all blade sizes. Motch & Merryweather Machinery Co.

28. Metals, Painting

Pictorial article featuring savings by treatment with Deoxidine, phosphoric acid metal cleaner and rust remover discussed in leaflet. American Chemical Paint Co.

29. Parts, Powder Metal

4-page leaflet describes complete facilities for producing powder metal parts of all kinds, with porosity or density controlled to meet specific requirements. Michigan Powdered Metal Products Co. Inc.

30. Piping, Stainless Steel

New booklet "Stainless Steel Piping—Why and Where to use it", deals with five major reasons for use, various types, fabrication. Tube Turns, Inc.

31. Polariscopes

Bulletin 143-74 on photoelasticity polariscopes describes apparatus used for obtaining experimental solutions to problems of stress distribution in mechanical parts and structures. Gaertner Scientific Corp.

32. Presses, Hydraulic

44-page booklet, well illustrated, presents the line of hydraulic production presses, with capacities from 3 to 7200 tons. A. B. Farquhar Co.

33. Rubber Products

6th edition "Manhattan Rubber Products for Industry" describes many mechanical and special items. Tank linings and abrasive wheels are covered. Raybestos-Manhattan, Inc., Manhattan Rubber Div.

34. Stainless Steel

36-page handbook simplifies selection of the right stainless steel. Compares qualities, characteristics, uses, mechanical, physical, electrical, magnetic, heat resisting and corrosion resisting properties. Extensive technical data in form of graphs, charts and tables. Alloy Metal Wire Co. Inc.

35. Surface Measurement

4-page leaflet describes the Proficorder for giving a clear chart record of the shape, height and spacing of widely-spaced surface irregularities, including long waves and bows, nonsymmetrical profiles, such as steps, plateaus, peaks and grooves. Shows fine roughness irregularities in full detail. Physicists Research Co.

36. Valves

Various types of slide and butterfly valves for control of fluids and gases are described in 24-page catalog. W. S. Rockwell Co.

37. Welding Control

General products catalog includes illustrated description of several controls for resistance welding. Raytheon Mfg. Co.

38. Welding Products

28-page welding products bulletin is complete treatise on how to keep equipment of all types operating and producing through conservation welding. Photographs, drawings, and descriptions explain the low-cost method of keeping parts by repairing, rebuilding, reclaiming and hard surfacing with welding rods and electrodes. Ingenious shortcuts are illustrated. American Manganese Steel Div., American Brake Shoe Co.

39. Welding, Resistance

40-page catalog is profusely illustrated and replete with diagrammatic and specification chart material on resistance welding tips, holders and alloys. Chart shows recommended electrode materials for spot welding similar and dissimilar metals. P. R. Mallory & Co. Inc.

40. Welding, Spot

4-page leaflet describes special multiple spot welder designed and built for toy manufacture. Operations are pictured and described in some detail. Sciaky Bros. Inc.

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Metals Review

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26b—Ferrous

26b-9. New Laboratory for Steel Control. Ralph G. Paul. *Western Machinery and Steel World,* v. 39, Feb. 1948, p. 90-93.

Facilities and layout of laboratory believed to be the steel industry's most modern spectrographic laboratory.

26b-10. Review of Iron and Steel Literature for 1947. E. H. McClelland. *Blast Furnace and Steel Plant,* v. 36, Feb. 1948, p. 212-216, 219.

31st annual classified review of iron and steel literature lists books and pamphlets published during 1947, with a few of earlier date not included in the previous review. Brief annotations where considered necessary.

26b-11. Cleaning of Service Water in Steel Plants. S. P. Kinney. *Iron and Steel Engineer,* v. 25, Feb. 1948, p. 56-59.

Self-cleaning water strainer has many potential applications for steel-mill use.

26b-12. Modern Temple to Steel Research. *Modern Industry,* v. 15, Feb. 15, 1948, p. 18, 20.

New Pittsburgh research laboratory of Heppenstall Co., producer of steel forgings.

26b-13. What's in the Future for Atomic Energy in Industry? J. A. Hutcheson. *Steel,* v. 122, March 1, 1948, p. 88-89.

Some of the formidable obstacles to be overcome before commercial use of atomic energy can be achieved.

NEW BOOKS

27a—General

27a-30. The Problem of Metal Corrosion. (El Problema de la Corrosion Metallica.) Emilio Jimeno. 237 pages. 1947. Ministerio de Marina, Instituto Espanol de Oceanografia, Madrid, Spain.

Importance of metal corrosion and theories behind it and attempts to apply the electron theory to explain numerous phenomena inexplicable otherwise. The electrochemical nature of corrosion is covered in detail. Effects of humidity, temperature changes, and various attacking agents, including organisms and incrustations are mentioned. Means of protection against attack—both external and internal—are given. The study was made in cooperation with the Spanish Institute for Oceanography.

27a-31. The Corrosion Handbook. Edited by H. H. Uhlig. 1188 pages. John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $12.00.

This new handbook, sponsored by The Electrochemical Society, Inc., and written by 103 authors, is a condensed summary of information about corrosion, including both scientific data and industrial experience. Discussion is concerned primarily with the behavior of metals and alloys at ordinary and elevated temperatures, and with the protection of metals against corrosion. There are sections dealing with the theory of corrosion (36 p.) and with corrosion testing (150 p.). Throughout the book, emphasis is on quantitative information. A Section on Special Topics in Corrosion (235 p.) includes chapters on corrosion by sea water, corrosion by soils, corrosion by micro-organisms, fundamental behavior of galvanic couples, hot and cold water systems, boiler corrosion, corrosion by lubricants, and the effect of mechanical factors in corrosion (stress corrosion). The sections on corrosion in liquid media, the atmosphere and gases, and on high-temperature corrosion are subdivided according to materials, which are discussed as follows: aluminum and alloys; cobalt and alloys; copper and alloys; iron and alloys; lead and alloys; magnesium and alloys; nickel and alloys; tin and alloys; zinc and alloys; precious metals; miscellaneous metals, and nonmetallic materials. In addition there are separate sections on materials resistant to high temperature and materials resistant to particular chemicals. T.L.

27a-32. Waterbury's Handbook of Engineering. Edition 4. H. W. Reddick. 386 pages. 1947. John Wiley & Sons, Inc., 440 Fourth Ave., New York. $2.50.

Formulas, equations, and numerical tables needed for use in general engineering work, with two major exceptions: the table of natural logarithms and chemical equations and tables. Field engineers, test men, students, and laboratory technicians will find this handbook useful for reference on the job. Engineering offices will probably find larger and more complete handbooks of better use in reference work.

27a-33. 49th Annual Report of the Mining Industry of the State of Idaho for the Year 1947. 256 pages. 1948. State of Idaho, Boise, Idaho.

Reports of accidents, items of general interest pertaining to mining, speeches given at various meetings, an extensive classified bibliography of Idaho's mineral resources, and a descriptive directory of all mines, listed by county. Statistical data is included in various sections of this report.

27a-34. Electrical Resistance Welding—A Bibliography of the Literature From Jan. 1936 to June 1947. Harold S. Card. 22 pages. The Author, 850 Euclid Ave., Cleveland. $1.00.

Data on 646 articles published in 49 technical and industrial magazines during the above period. Many of these titles are accompanied by synopses. The entire list has been indexed according to subject matter. Current standards publications and books are included.

27a-35. Bentley's Machine Shop Companion. 181 pages. Bentley Publishing Co., 31 King Street West, Manchester 3, England. 2s6d.

New edition has been thoroughly revised and considerably enlarged. It covers very adequately the needs of the machine-shop foreman and his men.

27a-36. Practical Design Handbook for Engineers. Alois Cibulka. 400 pages. Clarke & Courts, Houston, Texas. $6.00.

A reference book rather than a text, this volume presents in tabular and chart form a wealth of data in the mechanical, hydraulic, and structural fields. In a concise manner it reviews the fundamentals of the subject, presents a typical problem worked out in detail, and follows up with tables of data required for calculations. Much data and many shear diagrams of statically-indeterminate types, pressure vessels, shafts, gearing, and hydraulics. Useful mathematical and conversion tables.

27a-37. El Problema de la Corrosion Metalica. (Metallic Corrosion.) 237 pages, 1947. Ministry of Marine, Spanish Institute of Oceanography, Madrid, Spain.

A résumé of the economic losses due to corrosion and of the organizations tackling the problem in various countries. Mechanisms of corrosion of various types, and methods of protection. Up-to-date information given by authors of various nationalities. Few numerical data are given, attention being concentrated on principles.

27a-38. L'Electrochimie et L'Electrometallurgie. Tome I. Electrolyse. Tome II. Fours Electriques. (Electrochemistry and Electrometallurgy. Vol. I. Electrolysis. Vol. II. Electric Furnaces.) Edition 6. Albert Levasseur. 175 and 203 pages. 1947. Dunod, 92 Rue Bonaparte, Paris 6, France.

Vol. I covers electrolysis in aqueous solutions, its theory and applications, including a brief appendix on chemical uses of the electrical discharge. Vol. II is devoted entirely to electric furnaces, and their design, construction, and uses.

27a-39. An Introduction to Silicate Industries. H. N. Bose. 84 pages. 1947. Ceramic Publishing House, Church Road, Bhagalpur, India.

A short text on glass, enamels, pottery, limes, cements and plasters, and refractories and pyrometry.

27a-40. Metal Process Engineering. Norman E. Woldman. 291 pages. 1948. Reinhold Publishing Corp., 330 W. 42nd St., New York.

A text book covering various practical phases such as casting, mechanical working of metals and alloys, forging, powder metallurgy, joining of metals, castings vs. forgings vs. welds, heat treatment, surface hardening, machining of metals, and toolsteels. References are included at the end of each chapter.

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